SCIENCE

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VOLUME 111, NUMBER 2876

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SCIENCE

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Ten Million Scientists

Edmund W. Sinnott
Yale University, New Haven, Connecticut

IN 1948 the American Association for the Advancement of Science celebrated the completion of its first century. During that period the triumphs of science in technology have become so conspicuous, and the multitudinous products of its discoveries, from television to atomic bombs, hold now such promise and such peril for us all that one can hardly blame a layman for regarding the sciences as primarily a sort of glorified gadgeteering, chiefly important for their contributions to the physical requirements of mankind. It is also easy to understand the frequently expressed opinion that most of the troubles of our sorry world have come, directly or indirectly, from the advancement of science, which has not only given us machines beyond our moral ability to control but has pulled down ancient pillars of belief upon which so much of western civilization was supported. There is far too little popular understanding, however, of the true spirit and significance of science. The many beneficent influences which it has, or ought to have, not only on our physical welfare but on the higher levels of the life of man, are too often undervalued. Science may break down, but it can also build. This theme has often been discussed and is too vast for the space of a short address, and I shall try to explore only a corner of it here.

One of the serious problems of our day arises from the fact that certain high qualities in human life, much treasured in the past, are slowly breaking down, and that to replace their values men are turning to substitutes which are often fraught with peril. The ancient virtues of tolerance and open-mindedness, for example, tend easily to degenerate into a tepid neutrality; and to restore the spiritual motive power thus lost as convictions evaporate, we are tempted to revert to dogmatism and authority again. Among the graver dilemmas which we face, one thus has as its two horns the twin evils of indifference and intolerance. I shall try to show the beneficent effects in resolving this dilemma that would follow from a better understanding of the spirit of science and especially from a wider participation in its actual practices.

Just why does this dilemma now confront us?

In the confusion that followed the irruption of modern dictatorships, both of right and of left, the first reaction of free peoples was astonishment. Here are nations, we said, who seem to be turning back the clock of civilization; who have given up the hard-won privileges of freedom; who no longer respect the dignity of the individual but yield it up to an all-devouring state; who have discarded so many of the spiritual traditions of mankind but yet abase themselves before a Führer or a commissar almost as before a deity. Such men must have found something which to them seems very precious. For the first time in modern history democracy is thus on the defensive. We have so long assumed that freedom and the democratic way are ideals toward which any civilized society must inevitably move that we are shocked to find that millions deny their desirability. Democracy must have failed these men at some vital point, must have been unable to satisfy some deep human need. We must frankly face the uncongenial task of finding where this failure has been and what we can do to remedy it. Surely there is no other question that the free peoples of the world so urgently need to have answered. I believe that the difficulty lies deeper than in economic and political factors and that its solution will not come from novel social mechanisms but in a renewed vitality of the human spirit itself. And here is the argument:

Freedom suffers from the defects of its virtues. There has slowly grown among the free peoples of the world that ideal of tolerance (often too poorly realized in practice) which we admire as the fine flower of civilization—tolerance of differences in race, in habits of life, in religion, in all the many ways through which the biological and social divergencies of our kind express themselves. Indeed, democracy is the compromise that freedom makes with human diversity. It is here that a weakness begins to be evident. Lovers of tolerance have learned to find truth in such unexpected places that they are suspicious of the distinctions so long drawn between truth and error, beauty and ugliness, right and wrong. Does not truth, they say, depend chiefly on one's point of view? Will not a robust sympathy with everything human emancipate us from dogmas which so often have kept man's spirit in chains? There is beauty in the Parthenon, but one can find it in Epstein, too. Shakespeare and Milton are great poets, but Ezra Pound is worth a prize today. Moral codes are bound to change, and nothing is surer than that the heterodoxies of one generation will be the orthodoxies of another. Every religion has some good in it, and

we should not thrust ours on the rest of the world. So goes the argument to the pragmatic climax that truth is whatever we like to believe and that for free men absolute standards no longer exist.

This tolerant attitude, if pressed far enough, leads to the degeneration of something precious in human nature, *convictions*. If *anything* may be beautiful or right or true, are these qualities worth much anxious thought? Our ancestors believed they knew at least part of a body of absolute and eternal truth, and this belief was of the utmost moment in their lives. Our generation, however, hardly knows where it stands on issues which still are vital ones. In many of them we are no longer even interested. Such indifference and the moral flabbiness that follows it are among the chief dangers in modern life. The drive and enthusiasm that bring things to pass are the gift of those who are convinced, not those who are indifferent and uncertain. Tolerance breeds few martyrs. It is the zealot, the enthusiast, the dedicated man, who leads the crusades and slays the dragons. Without convictions, men and nations suffer in competition with others who have more spiritual motive power. This motive power totalitarianism knows well how to use. For a generation tired of moral insipidity and yearning for a great cause to which it can give itself, the dictators have offered one. The master race, or the rebirth of imperial Rome, or the dictatorship of the proletariat—these are such proffered causes. In each there has been a supreme prophet, a body of infallible dogma, and a rallying cry for a host of single-minded believers. Men of every station here march proudly together. The truth they hold in common becomes a holy cause which they are eager to serve. The inconsistencies, the cruelties, and the blind intolerance that are demanded of them they ignore. Something precious outweighs all these, and to underestimate its tremendous appeal to troubled and uncertain men is blindness. Today, when easygoing tolerance so often is the ideal attitude, and security is commonly reckoned the highest blessing, we may well forget man's tremendous capacity for dedication, his eagerness to nourish convictions, his persistent quest for certainty. The significance brought into his life by a cause and a creed often seems to him compensation enough for loss of freedom. Thus we are drifting toward the unhappy choice between indifference and intolerance. Unless we can resolve this dilemma, unless we can keep the human spirit free and at the same time restore to it the certainty that it has laid hold of some great truths about the way that men should live together, the future of democracy is dark indeed.

A similar dilemma, on a somewhat less exalted but perhaps equally important level, has boredom for one horn and hysteria for the other. One must admit, I think, that in our western world the enormous advances in knowledge and in our ability to use it for the greater safety and comfort of mankind have made life for most people much less interesting and stimulating than it used to be. Until recent times man was confronted by wide areas of the geographically unknown. The thoughts of youth indeed were long, long thoughts as it looked out over the mysterious ocean and wondered about the undiscovered reaches of the South Seas, as it thought of central Asia and darkest Africa and read the adventures of Captain Cook and of Lewis and Clarke. Whalers from New Bedford and Nantucket lost themselves for months in the unknown and came back with fabulous tales. No wonder boys ran away to sea. Adventurous and restless spirits from Daniel Boone to Kit Carson were always dreaming of "something lost behind the ranges." The existence of frontiers everywhere was a constant challenge. Their social and economic significance has often been stressed, but their stimulus to the imagination should not be forgotten. The Blue Ridge was more than a barrier to our West; it was a symbol of the mystery and excitement of the unknown.

Even the task of keeping body and soul together was more adventurous then than now. The dangers and vicissitudes of life made it a more arduous but a more exciting experience, for it was a daily contest with the elements and involved hazards now unknown. Monotony there often was, but rarely boredom.

Life is very different today. Most of the frontiers have disappeared. The blank spots on the map are nearly all filled in, and there are few challenges remaining to adventurous geographical explorers. Life itself is safer and less exciting. Gadgets of every kind lighten our labors and minister to our comfort, so that existence has become a routine of thermostats and switches and gears. Much labor has become monotonous repetition, lacking the variety and interest of craftsmanship. Fewer physical dangers impend. Someone has said that if medicine advances much further there soon will be nothing for us to die of save atomic bombs and boredom! I do not contend that the "good old days" were better than ours. Most of us would never willingly go back to them. But it must be admitted, I think, that life *has* lost some of its flavor, some of its exhilarating and exciting quality. It is tamer and more artificial than it used to be. Leisure has very greatly increased, but instead of being treasured and enjoyed it is too often something to be spent as painlessly as possible. Boredom for many has indeed become a real problem, and is one of the penalties of that indifference which so often distinguishes modern life.

This is a serious matter. "Without adventure," says Professor Whitehead, "civilization is in full decay."

Man at heart *is* an adventurer. He craves something to stir his pulses and lift him out of routine. He seeks a moral equivalent of the active, questing life of his ancestors, but to gain it he too often resorts to harmful expedients, to the hysterical stimulation of speed or alcohol or hectic, restless living. He gets his thrills at second hand by watching games or movies or the television screen. How to make life healthily interesting is therefore something our mechanical and gadget-ridden society is trying hard to learn. Hobbies, sports, intellectual interests—these are useful and important, but a major problem is to find means to employ one's leisure not only pleasantly but so that it shall be productive of that high satisfaction which comes from a vivid interest in something, from a sense of adventure. There are many fortunate men who do have this sense and whose lives are full and happy, but it must be admitted that all too often modern life is a pretty pedestrian affair.

Here again the dictator recognizes a growing psychological defect of our times and has moved to remedy it. His regimes always devote much attention to great spectacles, to magnificent shows. Organizations of every sort are set up to absorb the time and enthusiasm of many and are made attractive by uniforms and medals. Men and women everywhere are marching and singing, and underneath it all is the tense, often hysterical, enthusiasm that it is the business of a dictator to maintain. All this doubtless makes life more exciting and interesting for the citizen and helps bind him to the cause, but its artificiality is obvious. Whipped-up enthusiasm is no sound substitute for the rich stimulation life can know if its highest possibilities are fulfilled.

Such, then, is the dilemma we face—on the one hand that indifference, drifting into boredom, which has come with the tolerant, secure, and easy life of today; on the other the intolerance, restlessness, and hectic search for stimulation that are the all too common reactions to such an existence. This is by no means all that is wrong with our world, but if the dilemma I have described could be avoided if men could travel a sane middle way, which would combine freedom and tolerance with the conviction and enthusiasm necessary to give life its driving force and the flavor to make it the great experience that it should be, the world would surely be a safer and a happier place.

It is precisely here that science has something more valuable than its material gifts to offer our generation for, in its own field, it *has* resolved this dilemma. If the spirit of the true scientist could animate men everywhere, if they could share in the attitude that science at its best inspires in its practitioners, the unhappy alternatives that have been mentioned would be avoided.

I need not describe the scientific attitude here. The very basis of it must obviously be complete open-mindedness. Science can have no dogma, no arbitrary authority, no "party line." Every highway that may lead to truth must be kept open. When science capitulates to authority, as it now seems to be doing in Soviet Russia, little hope remains for other kinds of freedom. Nor do I need to mention the tolerant spirit of science or its enmity to prejudice—national, racial, or religious. It makes no difference whether a discovery is made by a German, a Chinese, or an American, a negro, a Jew, a Communist, or a Republican. The only criterion is whether the discovery is sound or not. Frontiers to science are unimportant. Research goes on everywhere, and journals published in one country are widely read in others. Most of us have correspondents and colleagues in other lands, and many of them have become our warm personal friends. The rational and friendly attitude science inspires is a sound antidote for the passion and hysteria that threaten the peace of the world. If the good will men of science normally feel toward each other were universal, wars would be much less likely.

But what of the other horn of the dilemma? Can science nourish those convictions and enthusiasms free men must have if their cause is to survive? I am sure it can. Science is by no means completely tolerant. Its goal is to seek out the truth, and its history has been one of steady progress toward this end. If truth could not be disentangled from error, science would have no meaning. So long as a particular element of truth has not been discovered or is only imperfectly known, the seeker's mind must be completely open to help from other quarters; but once a portion of the truth has been found, has been separated from error and become a part of the intellectual capital of mankind, then the conception of tolerance to ideas incompatible with it quite loses meaning. Tolerance of what has been proved to be untrue is manifestly absurd. Thus science builds an ever growing body of certainty, of assured and proved truth.

You may object that this certainty, well buttressed though it may be, is but a cold-blooded thing, and that the convictions it nourishes are not dynamic enough. Science may be a strong ally of freedom and tolerance, but its success as a stimulant of enthusiasm, as a substitute for the heroic marching songs of the totalitarians, seems most unlikely. Who will go to the barricades in defense of an equation? Faith and conviction have ever been more concerned with emotion than with intellect; but we should remember that the enthusiasm of the scientist, which burns with a much cooler flame than that of the fanatic, may well endure when passion and hysteria have run their course. The scientist does not goose-step behind a band to prove

his zeal, but his ears are listening to marching music of a subtler kind. His conviction of the truth of the laws he has discovered, though not shouted so loudly in the streets, is a deeper one than belief in the infallibility of Marx or the superiority of the Aryan race. And beneath it all, the foundation of every other human faith, is his supreme conviction that the universe is the abode of law, an orderly and dependable place.

As for boredom, that is one ill that surely no true scientist can ever suffer. To one who has felt the excitement—even the exaltation—of research and discovery, all other thrills seem tame. The man of science is the modern explorer, the spiritual descendant of Marco Polo and Magellan and Captain Cook. He pushes out across a wide frontier beyond which lies not simply an unknown wilderness but an unknown universe, undiscovered territory which is as full of surprise and adventure as the western ocean or the Indies ever were. He needs no artificial stimulation, but would rather be about his work than doing anything else in the whole world.

Thus the spirit of science, if it truly takes possession of a man, can carry him along the middle way which leads both to that freedom and tolerance so necessary for the democratic way of life and to the convictions and enthusiasms that keep life from growing flabby and stale. We well know that scientists are frail and fallible and that not all of them lead lives that are models for mankind to follow; but we must admit, I think, that if men everywhere could catch a glimpse of the spirit that science engenders in those who practice it—friendly, honest, tolerant, rational, adventurous—and if they could capture a little of it for their own lives, the future of the world today would look much brighter. I am not suggesting that all men should be scientists—Heaven forbid!—or that other agencies cannot be greatly effective toward the salvation of society. Surely an appeal to the high traditions of the past, to the lofty ideals that are the birthright of civilization, will much avail. The poet and the artist and the man of faith, all who cultivate the nobler emotions of mankind, these too are needed. But to aid them there are powerful resources at hand in the scientific spirit, all too little recognized, which can strongly combat those degenerative and divisive tendencies in modern life that we fear so much. Science should be far more than a gadgeteer for mankind, giving him tools he is often not wise enough to use. It should be a teacher, a restorer of minds distracted by clamorous falsehood and hate, a missionary of reason and good will.

There are few, I am sure, who would disagree with all this. The great problem is how to use these resources of the scientific spirit, how to make them effective and more readily available for the service of man. This is surely a question worthy of consideration by our great Association, and I want to turn your attention to the practical problem of how such a goal may be approached.

It is not easy. Obviously, more widespread and much better scientific education is one end for which we should strive. It is gratifying that teaching problems are occupying an ever larger place in our meetings and that among our affiliated societies are some that are concerned primarily with such questions, but much more needs to be done. We should endeavor not only to impart scientific knowledge but to give our students a true understanding of what the scientific method and spirit really are. Learning *about* science, even from inspired teachers, is to get it at second hand. This is useful and will lead the student to follow intelligently the progress of the sciences and, as a citizen, to form sound opinions about those human problems that science touches; but nothing can give the intimacy of understanding, the true feeling for science, like actually participating in its work. Here at first hand one catches its real flavor, knows the heady excitement of discovery, and learns what science really is like. One who has had this experience knows that there is no substitute for it.

But, one may object, such direct participation is limited to the small minority of practising scientists, men who have spent years in specialized training for their profession, and there is small place in it for others. Perhaps, however, we should take a somewhat less exalted view of scientific research. We are so familiar with its highly technical aspects—the use of electron microscopes, mass spectrometers, radioactive isotopes, and the scores of other elaborate tools of our profession, together with the mathematical subtleties necessary for an interpretation of the results obtained with these—that we sometimes forget the still vast areas where facts and principles of great scientific value may be discovered with no more complex tools or techniques than are at the command of any intelligent layman. Even to list all these would be impossible here. The exact distribution of plant and animal species, the records of flowering dates, the analysis of tree-ring chronology, the variability of wild species, bird censuses and the records of bird and insect migrations, the study of peat borings, the collection and identification of fossils, the distribution of minerals, detailed local weather observations, records of meteorites and of variable stars, time-lapse photography, problems of radio transmission—these are but a few of the many fields open to study by the amateur scientist. Let us not disparage such work as "anecdotal," as "mere natural history," simply because experiment and complex apparatus play a relatively minor part in it. Intelligent observation is at the bot-

tom of all research, and opportunities for this are almost limitless. There is ample room in science for the efforts of a vast body of enthusiastic laymen.

Science has much to gain from such a mass participation in its work. Consider the great contributions to astronomy made by that indefatigable band of men and women who form the American Association of Variable Star Observers, or of the revolution in our knowledge of bird migration resulting from the work of hundreds of devoted amateur bird-banders in recent years. The broad base on which such studies can be pursued through lay participation is far beyond the possibilities of any small professional group and constitutes a resource which is too often neglected. The amateur can also contribute in other ways. His fresh viewpoint and freedom from bias have often led to discoveries that his more inhibited professional brother had overlooked. Let us not forget that many whose names stand high in the history of science were largely self-trained amateurs.

But though science would gain much from a wider participation of laymen in its work, the gain to the laymen themselves would be much greater still. Science for everyone is a liberating experience. The very word *amateur* indicates that such a man loves what he is doing. One of the happiest persons I ever knew was an amateur botanist whose ambition it was to obtain a specimen of every species of the genus *Potamogeton* and to learn its distribution. This led him on extensive collecting trips and to correspondence and exchange with friends the world around. It added not a little to our knowledge of aquatic plants, but to him it was also an absorbing adventure. How stimulating it would be if such an experience could be duplicated many thousand fold! To a jaded generation, feverishly seeking distraction in so many artificial ways, such activities would be healing and invigorating, a means to that sane and rational attitude which will help avoid the dilemma we have been discussing. If this could be shared by a host of men and women, less intensively prepared than we are but no less truly explorers along the frontier of scientific adventure, mankind would be far better for it.

Aside from these advantages, to science and to the amateur, there is another important one. The practice of research by laymen would bring them much closer in spirit to professional scientists and thus help narrow the widening gap between these two portions of our society. The place of the scientist today, both in technology and as a leader of thought, has grown to be so important that he is often looked upon almost with awe by other men. His techniques are so complicated and little understood and his accomplishments so marvelous that many regard him as a sort of magician, set apart from the rest of mankind. This is unfortunate for all concerned. If science is to develop vigorously and to serve the world as it ought to, it should not be wrapped in mystery but must be understood, at least as to its spirit and methods, by those ordinary citizens upon whom it has to depend for support. The best possible means for bringing this about is a widespread participation of laymen in scientific work.

A not inconsiderable beginning toward such an end has already been made, and many amateurs are now industriously at work in the front lines of science. For mutual stimulation and exchange of ideas they are gathered into a host of organizations, ranging from the most unpretentious bird and nature clubs to societies essentially professional in character. An important function of many of these groups is to bring professionals and laymen together and thus to give the amateur the benefit of the wisdom of his more experienced colleagues. Our own Association and most of its affiliated societies include many amateurs in their membership. How many of these lay scientists there are in this country we have no means of knowing, but ten years ago W. Stephen Thomas estimated their numbers at over 150,000.

In 1938 the Carnegie Corporation and the American Philosophical Society set up a Committee on Education and Participation in Science which surveyed the activity of more than 700 amateur scientists in the Philadelphia region and helped organize a number of research projects in which very many more participated. Out of this came *The Amateur Scientist*, a book written by the secretary of the committee, W. Stephen Thomas. At about this time, too, a Committee on Private Research, also supported by the Carnegie Corporation, was set up at Western Reserve University for work in the Cleveland area. Many of the studies of amateurs with which it was concerned were in the sciences. The activities of this committee are described in a book by its director, William S. Dix, entitled *The Amateur Spirit in Scholarship*. The war unfortunately prevented an extension of these promising experiments.

The great programs of adult education are important means of stimulating amateur science, and one of the major tasks of the various state academies of science, affiliated with our Association, is to promote such education. But to gain a far wider participation by laymen in scientific work we shall doubtless have to begin with children and young people rather than adults. To this end the hundreds of science clubs, organized under the auspices of Science Service, are of great value in stimulating young people to an active interest in the sciences as a supplement to their classroom work. The nation-wide Science Talent Search is another important means of attracting into

science some of the best of our youngsters. It is a hopeful sign, too, that science teaching is gaining more attention than ever before. At this convention there is being held a very important series of meetings of organizations whose members are interested in problems of teaching.

We should not forget other means of educating laymen, young and old, than these more formal ones. The modern museum serves more and more as a center to awaken interest in science and to disseminate knowledge about it. Newspapers and magazines are also a most important source of popular scientific information, and the science news writer is therefore assuming a particularly serious responsibility in this matter, for much of what laymen learn about science now comes through his hands. The Westinghouse Award for Science Writers, administered by our Association, is proving an important means of raising the quality of their contributions.

But only a small beginning has been made, after all. Amateur scientists still are few and are often regarded with bewilderment by the unregenerate. Much missionary work must be done before a rabid Dodger fan will buy a vasculum and set out to collect the flora of Flatbush! Certainly most people will continue to find their relaxation and stimulus in other ways than ours, but I am sure there is a respectable minority who, if they could be introduced to one of those fields where the amateur scientists are working so well, if they could once savor the delight of learning at first hand something new about nature, would forsake the lesser satisfactions which now they seek. Surely if a small fraction of the enthusiasm and intellectual effort now devoted to the game of bridge, for example, could be mobilized for scientific work, what important results might follow! Is it too much to expect that in this wide land ten million men and women—one person out of every fifteen—might thus learn to devote a share of their leisure to the actual practice of the absorbing arts of the amateur scientist? You may think this an altogether unrealistic proposal, but if it could be attained, or even approached, I believe that the change it could accomplish would profoundly influence us all for good. We recognize our many grievous deficiencies. We need more tolerance, more good will to our neighbors near and far, more sturdy convictions, even a deeper love of freedom. We need to meet our problems with reason and sanity. We need a mental tonic in days of depression and despair. These goals are preached and plead for by our most devoted and enlightened leaders everywhere. We try in many ways, through school and church and public exhortation, to arouse our fellows to the need for a new spirit in the world. Such efforts accomplish much and should be pressed far, but they often seem discouragingly inadequate. Where a frontal attack of this sort may fail, however, perhaps more can be accomplished by indirection. If a great host of our fellows could once become deeply concerned, even in a humble way, with that vocation which is ours; if they could once share the absorbing interest that comes from dealing with nature at first hand and pushing out even a little way into the unknown; if they could learn the delight of comradeship in that high adventure, then those qualities so greatly desired and so needful for us all would come of themselves. They would appear as natural by-products of scientific activity and not solely as a result of persuasion and propaganda. One would cultivate a distant friend not simply as a dutiful gesture of international good will but for the very practical purpose of exchanging specimens of Coleoptera or records of meteorite showers. In the excitement of a joint project to explore a new fossil bed, the question of whether one's colleagues were of a different race or creed would lose its significance. Good will would come in full measure as a necessary consequence of working together. A man absorbed in the problems of bird banding or tree-ring analysis does not have to be preached to about the value of a hobby as a means of keeping him out of the hands of a psychiatrist. Anyone who has had the experience of marshalling scientific data and rigorously drawing sound conclusions from them will not easily fall a victim to wishful thinking or clamorous falsehood.

I do not maintain that all that is needed to make anyone an angel of light is for him to get a scientific hobby, but there are few therapeutic measures one can think of that would be better restoratives, physically and mentally, for the ills of today. Has not the time come when as professional scientists and good citizens we should turn our attention more vigorously to this problem? Our great Association has been dedicated for more than a century to the advancement of science. In the past this has been thought of chiefly in terms of research carried on by professional scientists. Should we not recognize more fully than we have done the immense possibilities for progress that are open in many fields of science if we can enlist a host of new colleagues to help explore them? And especially is it not our duty to exploit the great resources of the sciences not only for the discovery of truth and the increase of human comfort and safety but as a means for enriching and strengthening the spirits of men and breaking down barriers which now divide them? Science, like most human activities, has wrought many ills, but it has within it qualities of beneficence which, once understood and widely practiced, can greatly help the world. I commend to my successors in this high office the task of giving our Association a continuing leadership in this ministry of science to man-

kind. For such a campaign the regular professional army is not enough. We need volunteers, too, and many of them. Let us undertake, for our good and theirs, to mobilize a great body of such recruits. Let us aid in directing their energies into the high adventure with the universe which science is. Let us help, through the brotherhood of science, to promote the brotherhood of man.

Address of the Retiring President of the AAAS, delivered on the evening of December 28, 1949, at the 116th Meeting of the Association, in New York City.

The 102nd Year of the AAAS

Roger Adams

University of Illinois, Urbana

AT THE MIDPOINT of the 20th century, the American Association for the Advancement of Science can look back upon its achievements and remarkable growth. In the early days of its existence, it was a society whose divisions represented the chief organization for each science and at its meetings all scientists gathered together to present the results of recent research in each of their respective branches. As the number of scientists in particular fields increased, it was natural for independent societies to grow and new ones to be created which had meetings apart from those of the AAAS. There are now national organizations representing practically every division of the Association. The great growth of science in the United States has necessitated this cleavage and made imperative the formation of such societies. Few cities can provide adequate facilities for the meeting of as many as ten thousand scientists. Moreover, much smaller groups lend themselves more effectively to the widening of acquaintanceship and to technical discussions. Nevertheless, the old divisions of the AAAS are still actively functioning and have attractive programs at each meeting. The Association, as it did in the early days, provides opportunities for scientists in different fields to meet each other.

While these larger groups of scientists have been establishing societies of their own, many new smaller scientific organizations, often in specialized fields, have joined the Association as associated societies or as affiliates. The AAAS offers to these organizations a service which they could not maintain independently.

Today, upon entering its 102nd year, the Association is stronger than ever before, with its fifteen divisions, 87 associated societies, and 128 affiliates. It has not succumbed to the vicissitudes of the war and postwar years. A nominal advance in dues, a big increase in the membership, economies in the Washington office, and a larger advertising revenue have made it possible to operate with effectiveness and without a deficit, even though more income would permit merited additional functions. The membership is in the neighborhood of 45,000. The journals are successful and the symposia volumes have filled a need, besides proving profitable.

What may be expected in the future? The Association may look forward with optimism. Every effort will be made to improve *Science* to the point where it is in demand by all scientists. It is anticipated that the *Scientific Monthly* may eventually reach many more readers among the general public. The potentialities of these two journals are great.

Among the current functions of the Association may be mentioned the sponsorship for many years of the Gordon Research Conferences in Chemistry. Six to ten conferences have been held each summer with extraordinary success, and in the summer of 1950 the number will be increased to 15. Attendance is limited in order that the meetings may be kept strictly discussional. There is demand by chemists all over the country for invitations to these meetings and the conferences have had a far-reaching influence. For the Westinghouse Company, the AAAS has administered the annual Science Writing Awards, for excellence in science writing and distinguished science journalism. Since 1944, it has sponsored the Cooperative Committee on Science Teaching, of which a member of the Executive Committee, Karl Lark-Horovitz, has been chairman. Junior academies of science, composed of high school students, have been formed in about half the states of the union under the leadership of the AAAS, the state academies, and the public

school system. In these junior organizations the Association has a parental interest of which it is justly proud. Science Service was instrumental in the formation of various state science clubs, and the AAAS has cooperated by offering to the members of these clubs special honorary memberships in the Association. As early as 1898 it was forcefully advocated that local branches of the AAAS be established. But only recently have formal and active steps been taken to encourage their formation, either through the state academies or by direct petition to the Executive Committee of the AAAS. These illustrations typify the activities in which the Association has been engaged and what it may do in various areas. Such activities will be continued and new projects will be undertaken as the opportunity offers.

The meetings of the Association in the coming years may gradually change in character. The large number of papers presented in specialized fields is likely to become smaller, and papers spanning more than one field may increase accordingly. More symposia may be anticipated, in which men from many branches of science will take part.

The housing of the central offices of the AAAS has been a problem for many years. Because of the generosity of the Smithsonian Institution, rooms were provided in that building without cost. This space was outgrown as the functions and size of the Association expanded. Through the foresight of F. R. Moulton, former Administrative Secretary of the Association, a very desirable site in Washington, bounded by Massachusetts Avenue, Fifteenth Street, N Street, and Scott Circle, was found and later purchased from funds contributed by the members and from Association reserves. Headquarters were moved to one of the five buildings on the property and the others were rented. The one now occupied was not designed for offices and is in poor repair. Already more space is needed. To attempt to rehabilitate the present old dwellings would be very expensive and even when completed they would be unsatisfactory. The Executive Committee believes it opportune now to solicit funds for razing the present brick dwellings and for construction of a home worthy of the Association. The Washington force would then be able to operate far more comfortably and effectively than at present. With the concerted help of the membership, the goal can be attained.

The AAAS must be a mobile organization and of necessity dynamic, ready to serve science in the best way possible. Its policies must be adequately flexible to provide for changes with the times and the desires of its constituent units. During these days of international ferment in which the United States is involved, continued sturdiness in all scientific fields is essential insurance. The American Association for the Advancement of Science is playing a major role in bringing together scientists in different fields and in sponsoring activities which will strengthen science and the scientific roster of the country.

Kirtley F. Mather: President Elect, AAAS

Harlow Shapley

Harvard Observatory, Cambridge, Massachusetts

IN THE SELECTION of Kirtley F. Mather as President Elect of the American Association for the Advancement of Science, the Council has performed a twofold service that is much to its credit. It has chosen a competent administrative leader, and it has properly rewarded a member who has not been excelled in contribution to the Association. For the past few years the major problems before the Association have been numerous and difficult. In this postwar epoch the Association has increased greatly in membership and it has passed through its centennial year into the important second century. In these years a steady hand and a cheerful spirit are Mather's contribution to the work and responsibilities of the Executive Committee. Throughout his term of service, which will now continue for three years more, he has been unquestionably and justifiably popular with the Executive Committee, the Council, and the membership of the Association.

Mather has had a wide and long experience in presiding over scientific societies and other organizations, and he brings to his new position also a personal fortitude that is needed in these days of nervousness about loyalty probes and the civil liberties of scientists. His record as chairman of the Civil Liberties Union of Massachusetts, as national president of the American Association of Scientific Workers, and even long ago in the defense of science at the Scopes anti-evolution trial in Tennessee, bespeaks his firm position as an outspoken advocate of American free citizenship. He has played a leading role in opposition to the recurrent proposals for "minority oppression" legislation in Massachusetts, and his skillful open debate with the Attorney General a year ago was a turning point in the fight for academic freedom in the Commonwealth.

In another aspect of the Association's work Mather is an excellent choice at this time. He seeks to maintain a spirit of integration and coordination among the naturally diverging specialized sciences. Our national scientific societies need leaders who may in the main be highly specialized in a narrow field, but who have wide sympathies over the whole modern picture. Primarily a geologist and geographer, Mather is also effectively concerned with all problems of natural resources, and with their relation to government and human welfare. His concern with natural philosophy (in the modern sense) and with religion, with educational experiments and progress, and with the art of taking special knowledge from the field of experts to the areas where adult nonscientific citizens operate, indicates the catholicity of his interests and activities. The titles of his recent books illustrate this wide and human perspective:

Adult Education: A Dynamic for Democracy (with Dorothy Hewitt)
Science in Search of God
A Source Book of Geology (with S. L. Mason)
Sons of the Earth
Enough and to Spare
Crusading for Life.

These are in addition, of course, to numerous technical papers that have in large part resulted from Mather's long association with the U. S. Geological Survey.

The new President Elect has throughout his life known many parts of America and many phases of American life. Born in Chicago and preliminarily educated at Denison and Chicago Universities, he has continued his education as teacher at the University of Arizona, Queens College (Ontario), Denison University, and Harvard University since 1924, and in numerous travels all over North America for the U. S. Geological Survey and with student groups. He has undertaken two extensive surveys in South America for a commercial company. In the past three years he has made trips through Europe that should be useful in working with international problems of the Association. Mather was the official representative of the American Association in 1947 at the meeting of the British Association for the Advancement of Science in Dundee, Scotland, and he has been both Secretary and Vice President of the AAAS Section on Geology and Geography.

His travels and his many acquaintances have naturally made Mather's public lectures outstanding, and have brought him into cooperative relations with many scientific, educational, and religious groups in America and abroad. In the summers of his early student years in the Midwest, before his geological travels began, Mather carried through the rather usual American program of experimenting with some of the tough realities. He has been office boy, factory worker, ticket seller, salesman. In later days he has worked hard at a different level. Some of these mature labors for the good of science and society should be men-

tioned. His "Scientist's Bookshelf" for the *American Scientist* is probably the best periodical review of scientific books that is now available. His unique course in general education in Harvard University, "The Impact of Science on Modern Life," is for more than geologists; it is, in fact, given in the Department of Social Sciences. His work, as chairman, for the Massachusetts Civil Liberties Union has been mentioned. The "Mather Report" on the condition and problems of the American Academy of Arts and Sciences has been made the basis of the new policies of that ancient society. As president of the Newton (Massachusetts) Community Forum, and as an organizer of the Boston Center of Adult Education, he has shown his responsiveness to problems of his community.

These are only a few of the scientific and social activities of the Association's new President Elect. We can summarize by saying that he is practical enough to be an authority on the national petroleum resources, and idealistic enough to dream about a planet peopled with decent and well-fed world citizens. Both the practical and the ideal will be useful in the new post to which he has been elevated by the American Association for the Advancement of Science.

A Report of the New York Meeting, December 26–31, 1949

Raymond L. Taylor

Assistant Administrative Secretary, AAAS

The 116th Meeting of the American Association for the Advancement of Science came to an end shortly after 6 p.m., Saturday, December 31, when the last paper of the final program—Section C, Chemistry, was read. The official opening was 2 p.m., Monday, December 26, with the first showing of scientific films in the Science Theatre, the completion of the preparation of the exhibits in the Annual Science Exposition, and the initial session of Section H, Anthropology. In between there were nearly 400 sessions, large and small, and the ebb and flow of all those who had traveled, many of them great distances, to establish contact with colleagues in all the principal fields of science. In one sense the Meeting has become history, but in another sense its stimulating effects will continue for many months. Both for those who attended and for those who did not come, it is appropriate to summarize this Annual Meeting of the AAAS for the year 1949.

Attendance. The 116th Meeting was by far the largest one in the Association's 101 years. According to reports from many sources, it was also one of the most successful. Despite its record-breaking size, it was one of the most convenient meetings, since the large majority of the sessions took place in five hotels and the Manhattan Center, all within a single block from Pennsylvania Station and two blocks from each other.

Mere size, however, is not the criterion of a successful scientific convention—though, naturally, one meets more fellow workers, old friends, and former teachers and students, especially in different fields, at a well-attended meeting. The adequacy of the physical arrangements, the caliber of the programs, the relative convenience of the session rooms of related societies, the arrangements for projection and other adjuncts, are all factors to be taken into account. In general, therefore, the Sixth New York Meeting ranks high.

A combination of factors was responsible for the decidedly exceptional attendance: 1) All but one of the Association's 17 sections and subsections had programs, all excellent and a number with multiple sessions. 2) Sixty-one organizations participated. These comprised affiliated and associated societies principally, but also some others that do not always meet with the AAAS. 3) There was no full-scale December Meeting in 1948, it having been replaced by the Centennial Meeting in Washington in September. 4) There had been a lapse of 21 years since the previous Meeting in New York. 5) The size of the metropolitan area and its scientific and student population contributed to the size of the Meeting. 6) There was also, perhaps, a feeling that the threat earlier in the year, of an incipient economic depression, was entirely dissipated. (Other conventions also found 1949 a big year). It is unlikely that Association meetings will reach this record-breaking size again in the immediate future.

Meeting Rooms and Projection. Including those on the campus of Columbia University, there were 398 sessions, business meetings, and meal functions scheduled at the 116th Meeting. In the five Penn Zone hotels—the Statler, the New Yorker, the McAlpin, the Martinique, and the Governor Clinton—42 public rooms, with capacity from 25 to 1,400, were used throughout the week, without charge either to the Association or the societies. To accommodate the American Sociological Society, which came in late, it was necessary to rent three meeting rooms for three days at the Manhattan Center; the Association was able to share this cost in view of the high percentage of registration by the sociologists. At Columbia University, 21 additional meeting rooms were used by the socie-

ties—the mathematicians and some of the biological societies that preferred academic rooms or found them essential for demonstrations that required microscopes.

Of these sessions (nearly 400), 294 required projection equipment, principally lanterns and screens, and operators. Projection can be exceedingly expensive. In the past, the Association has always absorbed all such costs. In 1949, as the result of the vote of a large majority of the participating societies, it was planned that the AAAS would share projection expenses according to a formula based equally on the average percentage of registrants at a society's sessions and on the percentage of its members also members of the Association. (A society with 90% registration and 90% AAAS membership would have had 90% of its projection costs paid by the Association; a society with 50% registration and only 10% AAAS membership would still have been assisted to the extent of 30% of its projection costs.) At the last minute, it became possible for the Association to cover *all* projection costs, hence *at the 1949 December Meeting no society was called on to pay anything for projection.*

Planning the Meeting. Many who attend sessions do not realize the amount of planning and work that goes into the smooth functioning of each session. The cooperation of many individuals is utterly essential. In the spring, months ahead, the secretary of each section or society must estimate the probable number of sessions and the expected attendance. (It is understandable that underestimates of attendance were common for 1949.) Headquarters hotels for related societies are decided upon, and meeting rooms are then assigned in as logical a manner as possible. The same rooms are kept for a given section or society wherever possible, and parallel meetings are scheduled for near-by rooms. The needs and wishes of each society are carefully considered. The disadvantages of a room that is "tight" are weighed against the inconvenience of a campus room twenty minutes away. Meeting projection needs and checking the rooms constitute a considerable task. At this point, a tribute is particularly due Harold H. Clum and members of his Local Committee on Equipment and Projection, and all others who worked hard and long on this phase of the Meeting. In the general planning, J. W. Barker, general chairman of local committees and George B. Pegram and the Local Advisory Committee that he headed provided invaluable assistance.

Registration. Paid registrations, which are absolutely necessary to pay the costs of the Meeting, totaled 7,014. Perhaps twice that number of people actually visited the Annual Science Exposition or attended certain sessions. In this connection, it should be recalled that certain of the large evening lectures were open to the public by invitation, as were some of the section programs.

On the other hand, some scientists who attended technical sessions all week failed to register. Registration *should* pay for the cost of printing the general program and the other considerable expenses. In the past, deficits have been incurred, not from mismanagement, but from a lack of understanding on the part of some scientists that payment of a registration fee, a fraction of the cost of one night's hotel room cost, is an obligation conscientiously to be met. Though figures are still incomplete, the 1949 Meeting was definitely "in the black." In the metropolitan area of New York City, 475 local members contributed $2,087.50, which was applied to the costs of refreshments at the Presidential Reception and the Academy Conference Dinner and the balance to general expenses. These generous members were hosts of those who attended; they were in effect making up for those who should have registered. It is heartening that to these local members—a number of whom also volunteered services and worked throughout the week—the AAAS is something more than the source of *Science* and *The Scientific Monthly*, or a remote headquarters in Washington. In addition, 44 firms in science and industry contributed a substantial sum and thus were cosponsors of the 116th Meeting. The Association is indebted to R. W. King, of the Bell Telephone Laboratories, and his local Committee on Finance and gratefully acknowledges the contributions received.

In the past, it has been suggested that registration should be mandatory. This would necessitate guards at the door of each meeting room and create embarrassing incidents. With the Meeting as diversified as it is, it is considered impractical and undesirable to attempt to enforce a closed meeting. It has also been suggested that the registration fee should be increased. This fee has been kept at the low figure of $2.00 for members of the Association, students and spouses of registrants, and $3.00 for nonmembers, in order to encourage a wide attendance of interested persons.

In comparison with this record figure of 7,014, the largest previous Meeting was at Chicago in 1947, when the registration was 4,940. Registration at the Fifth New York Meeting of 1928 was 3,935. On only four other occasions has AAAS registration exceeded 3,000—viz., Washington, D. C., 1924 (4,206); Philadelphia, 1940 (3,339); Philadelphia, 1926 (3,181); and Indianapolis, 1937 (3,094). It is felt that the percentage of registration at the 1949 Meeting was higher than usual, although still considerably below what it would have been if each regular member of the participating societies had realized his obligation. The Association is confident that this situation will gradually improve.

The following statistics indicate that there were registrants from every state in the union but Arizona and Idaho.

DISTRIBUTION OF REGISTRANTS BY STATES

New York	2,585	Indiana	113
New Jersey	598	Virginia	102
Pennsylvania	514	North Carolina	100
Massachusetts	351	California	96
Maryland	265	Wisconsin	93
Illinois	253	Tennessee	67
Connecticut	248	Missouri	59
District of Columbia	238	Iowa	57
Ohio	216	Georgia	53
Michigan	207	Texas	52

Louisiana	50	Alabama	20
Minnesota	50	South Carolina	19
Rhode Island	44	Oklahoma	18
Maine	43	Nebraska	17
West Virginia	43	Mississippi	16
Vermont	33	New Mexico	9
New Hampshire	29	Arkansas	8
Delaware	28	Utah	8
Kansas	24	Montana	5
Colorado	23	Wyoming	5
Florida	23	Oregon	4
Kentucky	23	North Dakota	3
Washington	21	South Dakota	2
		Nevada	1

The effects of such factors as scientific centers and geographic distances are obvious, but the totals from the Pacific Coast, the Southwest, and the South are impressively large.

The Dominion of Canada contributed 96 (Ontario 45, Quebec 37, Nova Scotia 6, Saskatchewan 4, Manitoba 3, Alberta 1). The territories of the United States were represented by 9 from Puerto Rico, and one each from Hawaii and Alaska.

Foreign registrants are grouped by continents below. Most of these registrants were students or exchange professors; they lent a welcome international aspect to the Meeting.

DISTRIBUTION OF FOREIGN REGISTRANTS BY COUNTRIES

North America		*Asia*	
Mexico	6	China	7
Costa Rica	3	India	6
Bermuda	1	Israel	2
British West Indies	1	Pakistan	2
Honduras	1	Iran	1
Trinidad	1	Straits Settlements	1
South America		*Africa*	
Brazil	4	Egypt	3
Venezuela	2		
Argentina	1		
Columbia	1		
Europe		*Australia*	
England	6	Australia	3
France	4	Tasmania	1
Denmark	2		
Finland	2		
Greece	2		
Spain	2		
Sweden	2		
Switzerland	2		
Holland	1		
Norway	1		

The subject fields are not as readily analyzed from the registration cards. Some registrants listed as a field of interest a restricted research specialty, whereas others named two or more major sciences (in which case only the first one was counted). The scientific fields of the 7,014 registrants are grouped below under Association Sections A–X. There was a considerable amount of overlapping of interests which could not be taken into account.

REGISTRANTS' FIELDS OF INTEREST

A—*Mathematics*	
Mathematics	103
Mathematical statistics	20
B—*Physics*	
Biophysics	25
Electronics	9
Meteorology	5
Nucleonics	5
Physics (including optics, sound, etc.)	299
C—*Chemistry*	
Biochemistry	196
Chemistry (both inorganic and organic)	442
D—*Astronomy*	
Astronomy	49
E—*Geology and Geography*	
Geography	19
Geology	116
F—*Zoological Sciences*	
Embryology	75
Entomology	38
Histology	11
Ichthyology	5
Parasitology	172
Protozoology	24
Zoology (including anatomy, animal behavior, etc.)	568
FG—*Biological Sciences*	
Bacteriology	93
Biology	461
Biometry	7
Cytogenetics	15
Cytology (including cellular physiology)	88
Ecology	91
Evolution	7
Fisheries biology	17
Genetics (including human genetics)	265
Limnology	21
Microbiology	80
Oceanography	15
Paleontology	10
Radiobiology	10
G—*Botanical Sciences*	
Botany (including bryology and phycology)	452
Mycology	85
Paleobotany	12
Plant morphology	14
Plant pathology	166
Plant physiology	150
Plant taxonomy	28
H—*Anthropology*	
Anthropology	51
I—*Psychology*	
Child development	23
Psychology	236

K—*Social and Economic Sciences*	
Economics	23
Rural sociology	29
Sociology	435
L—*History and Philosophy of Science*	
History and philosophy of science	24
M—*Engineering*	
Engineering (all types)	88
N—*Medical Sciences*	
Cancer research	10
Dentistry	41
Endocrinology	97
Medicine (including pathology, surgery, etc.)	383
Neurology	6
Nutrition and food technology	24
Pharmacology	66
Physiology	208
Psychiatry	22
O—*Agricultural Sciences*	
Agriculture (including soils and agronomy)	27
Forestry	5
Horticulture	8
Q—*Education*	
Educational books and publishing	26
Education	55
Science teaching	114
X—*Science in General*	
Nature study and conservation	27
General, or no field stated	646

This tabulation does not include such fields as air pollution, geophysics, linguistics, microscopy, pediatrics, photography, and public health, with three or four registrants each.

Two points are apparent from these figures. A strong sectional program, such as physics or medicine, will attract a considerable attendance even though not one society in that field may be participating. And those interested in fields between two of the older disciplines—for example, biophysics—are attracted by the symposia and joint sessions that have come to be expected at AAAS meetings.

The comment is sometimes made, "The AAAS Meetings are too large; there are too many sessions I should like to attend going on at the same time." This has a basis of truth, but anyone faces the same indecision when he ponders a menu or which necktie to wear. It should not be too serious a criticism, for usually it *is* possible to make a choice, or to attend parts of several concurrent sessions when these are nearby. Further, this condition is not restricted to meetings of the Association. In the program of the Botanical Society of America, for example, spread over four days, there were no less than seven concurrent sessions on certain days, two of them in plant physiology. It is difficult, if not impossible, for the secretary of a society to schedule as many sessions as this without presenting a conflict of interests to some of those who attend. The same problem will exist whether the botanists meet apart from the AAAS or not.

Advance Registration. Registration in advance offers those who attend the meeting the obvious advantages of avoiding congestion at registration desks and receiving their general programs ahead of time so that they can decide at their leisure which sessions to attend. For the 116th Meeting, 2,897 registered in advance. Since *some* of these failed to receive their programs in time it is felt that an explanation is due those who were inconvenienced in this way. Programs were mailed to the 1,923 who registered prior to December 2 by the printer, between December 6 and December 9 at the Boston Post Office. These programs had to travel fourth class, since first class was too costly and they were technically ineligible for either second or third class. In general, the programs were delayed at one terminal after another, as preference was given to Christmas packages and greeting cards. In some cases—not too numerous it is hoped—delivery was not made until January. An additional 974 registered between December 2 and December 22 (the preconvention issue of *Science*, December 9, advised against advance registrations that might be received later than December 12). Of these, 300 were mailed programs from the Washington office to near-by points on December 16 but the remainder were advised by a special letter that the time was now so late that it was safer to call for their programs upon arrival. (Incidentally, this mailing could have been three days earlier except for a fog that delayed air freight shipments that week.) Although the circumstances were largely beyond the Association's control, an apology is tendered all who were inconvenienced. It has been a pleasure to find that most of those temporarily disappointed were gracious and understanding.

At its last session, Thursday, December 29, the Council of the Association voted overwhelmingly to continue advance registration. For the Cleveland Meeting, however, no advance registrations will be accepted later than December 1, mailings will be made not later than December 3, and the Post Office will be asked for faster service.

The Visible Directory. The visible directory of registrants—a series of Kardex files, long familiar to those who have attended AAAS Meetings in the past—was located in a quarter of the Salle Moderne and was much consulted throughout the week. The typed cards of advance registrants, posted before the meeting, were completely alphabetized; necessarily, the cards of those who registered upon arrival, though posted as promptly as possible, could not be alphabetized beyond the initial letter.

Housing. The experienced Housing Bureau of the New York Convention and Visitors Bureau processed the room applications of 3,061 persons with marked efficiency. In most cases the direct confirmation of the hotel was received well within the advertised period of two weeks. Replies to inquiries indicate complete satisfaction on this score. It is impossible to estimate closely how many additional persons from out of town secured rooms directly or stayed outside of the Penn Zone with friends and relatives, but the out-of-city registrants totaled considerably more than 5,000.

Points of Special Interest, Tours, etc. A considerable variety of tours and special arrangements for the entertainment of scientists attending the Meeting was available throughout the week. The number who availed

themselves of the special exhibit at the New York Public Library, or visited New York's museum's of art, the botanical gardens, and the industrial concerns that made special arrangements, is not known, but those who went were most appreciative of the hospitality extended. The Association is indebted to all these local institutions and to George S. Avery and his Committee on Entertainment, and also to Stuart Dorman, McGraw-Hill Company, whose local Reference Committee provided facts and figures in advance and supplementary travel directions at the Meeting itself.

The Science Theatre. Eleven periods of four hours each—including one evening—were devoted to 50 different films of interest to scientists. Most of these were several reels in length. Each film was shown twice, and those selected for Saturday morning three times. The theatre was well patronized and the films very well received. The room was kindly lent by the First District Dental Society of New York, to whom appreciation is expressed.

The Biologists' Smoker. The 1949 edition of the Biologists' Smoker was held in Roosevelt Hall of the American Museum of Natural History. This traditional event, sponsored by the American Society of Naturalists, this year was managed by the Association at the society's request. The general comment received was that it was "excellent" and "a distinct success." About 3,000 attended. The museum provided not only physical facilities but most hospitably absorbed the considerable costs of overtime custodial care and checking service. All refreshments and cigarettes were donated. On behalf of those who attended, the Association expresses its appreciation to the Coca-Cola Company, the Hoffman Beverage Company, distributors of Pabst's Blue Ribbon beer, the National Biscuit Company, and the American Tobacco Company, manufacturer of Lucky Strike cigarettes, for their courtesy and hospitality.

Press Service. The Press Room on the mezzanine of the Hotel Statler was exceptionally busy throughout the entire week. A total of 252 science reporters and radio and television representatives covered the 116th Meeting —also something of a record. Daily accounts concerning various papers presented appeared in all the principal newspapers of this country and many abroad; they were also broadcast by New York City radio and television stations. Feature stories, not requiring such close deadlines, have been published widely since the Meeting and will continue to appear for some time. The Association is deeply appreciative of the attention paid its annual meetings by the press, radio, and television.

Valuable assistance was rendered by the Local Committee on Publicity, headed by Hayden Weller, director of public relations, New York University, in drawing attention to the Meeting especially in local institutions of higher learning. Mayor O'Dwyer's action in proclaiming the week of December 26–31 as Science Week in New York City is greatly appreciated by the Association.

The Annual Science Exposition. The evening of Sunday, Christmas Day, the Penn Top and Salle Moderne were bare echoing rooms. Beginning at midnight, a corps of workmen of the Strauss Decorating and Exposition Company erected 86 booths in four hours, after which the Center Trucking Company and hotel baggage personnel brought in the crated apparatus and books of the 70 exhibitors who had contracted for the limited space available. At 2 p.m. Monday, December 26, the largest and one of the most diversified and attractive series of exhibits was opened. A Monday morning crowd, not expected till afternoon, had watched the preparations impatiently. Thereafter, the exhibit area was crowded throughout the week. Comments by both visitors and exhibitors have been most favorable. Already several firms have asked for additional space in the 1950 Annual Science Exposition to be held in the Public Auditorium of Cleveland, and those who could not be accommodated in the 1949 Annual Science Exposition plan to be there. It is unmistakably indicated that the Exposition is of mutual advantage both to the scientists who attend and to those who provide the tools and materials of science. The Association takes this opportunity to express its appreciation of the efforts of all concerned with the exhibits to make the Annual Science Exposition the decided success it was.

Organization of a new society. In the past, new societies have come into being at the AAAS Meetings, and 1949 was no exception. The organizational meeting of the Society of Industrial Microbiologists (FG13 in the general program), was held Thursday, December 29, as scheduled. Between 250 and 300 were present, 165 members were enrolled, and dues of $2.00 were collected. All who join in 1950 will be considered charter members. Charles Thom, Port Jefferson, New York, was elected chairman to preside at this meeting and now heads an Organizing Committee consisting of E. A. Walker, U. S. Department of Agriculture, Washington; M. M. Baldwin, Battelle Memorial Institute; W. L. White, Farlow Herbarium, Harvard University; L. Barail, U. S. Testing Company, Hoboken; R. G. H. Siu, Philadelphia Quartermaster Depot; W. N. Ezekiel, Navy Department, Washington, D. C.; and C. L. Porter, Department of Biological Sciences, Purdue University, who will act as secretary-treasurer. It will be the task of the organizing committee to draw up a constitution and to prepare a program for the new society's next meeting.

In closing this account of the New York Meeting, the writer wishes to acknowledge his great indebtedness to all secretaries and program chairmen, the local committees, the hotel sales managers, the volunteers, the director of the Press Service, the office staff, and to many others who gave their fullest cooperation. Without such help the 116th Meeting would have been quite different—if it had occurred at all!

Reports of the secretaries of the sections and societies that were received in time follow on page 139.

Association Business

Howard A. Meyerhoff

Administrative Secretary, AAAS

AAAS Officers—1950

General Officers

President: Roger Adams, University of Illinois.

President Elect: Kirtley F. Mather, Harvard University.

Retiring President: Elvin C. Stakman, University of Minnesota.

Vice Presidents and Chairmen of Sections:

Mathematics (A): Einar Hille, Yale University.

Physics (B): Robert B. Brode, University of California.

Chemistry (C): H. S. Booth, Western Reserve University.

Astronomy (D): C. D. Shane, Lick Observatory.

Geology and Geography (E): K. K. Landes, University of Michigan.

Zoological Sciences (F): L. V. Domm, The University of Chicago.

Botanical Sciences (G): John S. Karling, Purdue University.

Anthropology (H): Margaret Mead, American Museum of Natural History.

Psychology (I): Douglas Fryer, New York University.

Social and Economic Sciences (K): E. W. Burgess, The University of Chicago.

History and Philosophy of Science (L) (not yet named).

Engineering (M): Morrough P. O'Brien, University of California.

Medical Sciences (N): Joseph C. Hinsey, Cornell University Medical College.

Agriculture (O): Richard Bradfield, Cornell University.

Education (Q): Palmer O. Johnson, University of Minnesota.

Members of the Executive Committee

Elvin C. Stakman (Chairman), University of Minnesota (1950).

Roger Adams, University of Illinois (1949–1951).

George A. Baitsell, Yale University (1947–1950).

John R. Dunning, Columbia University (1950–1951).

Edwin B. Fred, University of Wisconsin (1948–1951).

Paul E. Klopsteg, Northwestern University (1949–1952).

Karl Lark-Horovitz, Purdue University (1949–1952).

Kirtley F. Mather, Harvard University (1950–1952).

Howard A. Meyerhoff, AAAS (1949–1952).

Fernandus Payne, Indiana University (1950–1953).

Paul B. Sears, Oberlin College (1950).

Malcolm H. Soule, University of Michigan (1949–1952).

Warren Weaver, Rockefeller Foundation (1950–1953).

Elvin C. Stakman

Roger Adams

Kirtley F. Mather

Administrative Officers

Administrative Secretary: Howard A. Meyerhoff, 1515 Massachusetts Ave., N.W., Washington 5, D. C.

Assistant Administrative Secretary: Raymond L. Taylor, 1515 Massachusetts Ave., N.W., Washington 5, D. C.

General Secretary: Karl Lark-Horovitz, Purdue University, Lafayette, Indiana.

Treasurer: William E. Wrather, U. S. Geological Survey, Washington, D. C.

Secretaries of Sections:

Mathematics (A): Raymond W. Brink, University of Minnesota, Minneapolis, Minnesota.

Physics (B): F. S. Brackett, National Institutes of Health, Bethesda, Maryland.

Chemistry (C): Edward F. Degering, Purdue University, Lafayette, Indiana.

Astronomy (D): Frank K. Edmondson, Indiana University, Bloomington, Indiana.

Geology and Geography (E): Leland Horberg, University of Chicago, Chicago, Illinois.

Zoological Sciences (F): J. H. Bodine, University of Iowa, Iowa City, Iowa.

Botanical Sciences (G): Stanley A. Cain, Cranbrook Institute of Science, Bloomfield Hills, Michigan.

Anthropology (H): Marian W. Smith, Columbia University, New York, New York.

Psychology (I): Delos D. Wickens, Ohio State University, Columbus, Ohio.

Social and Economic Sciences (K): Paul Webbink, Social Science Research Council, New York, New York.

History and Philosophy of Science (L): Raymond J. Seeger, Bureau of Ordnance, Navy Department, Washington, D. C.

Engineering (M): Frank D. Carvin, Illinois Institute of Technology, Chicago, Illinois.

Medical Sciences (N):

Subsection on Medicine (Nm): Gordon K. Moe, University of Michigan, Ann Arbor, Michigan.

Subsection on Dentistry (Nd): Isaac Schour, College of Dentistry, University of Illinois, Chicago, Illinois.

Subsection on Pharmacy (Np): Glenn L. Jenkins, Purdue University, Lafayette, Indiana.

Agriculture (O): C. E. Millar, Michigan State College, East Lansing, Michigan.

Education (Q): Dean A. Worcester, University of Nebraska, Lincoln, Nebraska.

Officers of the Pacific Division

President: L. S. Cressman, University of Oregon.

Secretary: R. C. Miller, California Academy of Sciences, Golden Gate Park, San Francisco, California.

Officers of the Southwestern Division

President: O. B. Muench, New Mexico Highlands University, Las Vegas.

Secretary: Frank E. E. Germann, University of Colorado, Boulder, Colorado.

AAAS Council

At the meetings of the Council held in New York City on December 27 and 29, in addition to the election of officers and Executive Committee members, the following actions were taken:

1. The question of retaining the distinction between members and fellows in the Association's membership was referred to the Executive Committee for study and recommendations at the Council meeting in Cleveland in 1950.

2. The President was instructed to appoint a committee to study the evaluation of scientific merit, with specific reference to the resumption of starring in *American Men of Science*. This committee is to report at Cleveland

3. A plan to combine technical sessions with conferences and symposia at the 1950 Meeting in Cleveland was approved, with the understanding that the type of meeting be reviewed on the basis of experience at Cleveland.

4. Authorization was voted the Administrative Secretary to have an Association lapel button designed.

5. The Executive Committee was instructed to study ways and means of providing new and adequate building facilities for the Association.

6. The Inter-Society Committee for a National Science Foundation was voted an emergency credit of $600.00.

7. A resolution passed by the Ecological Society of America on "The Study of the Methodology of Human Ecology by the United Nations and the United Nations Educational, Scientific and Cultural Organizations" was endorsed.

8. Reports from the following committees were presented:

a) Executive Committee, including the Publications Subcommittee, Subcommittee on a New Building, Editorial Board.

b) Cooperative Committee for the Teaching of Science.

c) Committee on Affiliation and Association.

d) Special Committee on the Civil Liberties of Scientists.

9. The Council voted to continue the policy of advance registration at annual meetings.

10. The President and Administrative Secretary were instructed to draw up a resolution expressing appreciation to the local groups and organizations that contributed to the success of the New York meeting.

AAAS Membership

1. *Changes during 1949.*

New members		4,474
Deaths	221	
Resignations	1,422	
Automatic resignations	1.199	
Total outgoing		2,842
Net increase during 1949		1,632

2. *Totals as of 31 December 1949.*

Paid for 1949	33,197	In good standing	41,196
Paid through June 1950	7,411	In arrears	2,592
Life members, etc.	588		43,788
		New for 1950	1,159
		Total membership	44,947

Reports of Sections and Societies[1]

The American Mathematical Society (A1)

The 56th annual meeting of the society was held at Columbia University, December 27–29, in conjunction with the annual meetings of The Mathematical Association of America and the AAAS. Residence headquarters were at the Hotel Governor Clinton and registration headquarters in Earl Hall, Columbia University. More than 700 persons registered for the mathematical meetings, including 665 members of the society.

At a joint session of Section A and the society at 2: 00 p.m., Tuesday, December 27, G. T. Whyburn of the University of Virginia gave an address, "The Open Mapping Medium in Topological Analysis," as a retiring vice president of the AAAS. The presiding officer was E. J. McShane, chairman of Section A.

Two invited addresses were given on Wednesday: one at 9: 30 a.m. by S. Chowla of the University of Kansas on "The Riemann Zeta and Allied Functions" and one at 2: 00 p.m. by L. V. Ahlfors of Harvard University on "The Classification of Open Riemann Surfaces." Vice Presidents W. T. Martin and Hassler Whitney presided at these sessions.

The 23rd Josiah Willard Gibbs Lecture entitled, "The Problem of Sensory Prosthesis," was delivered by Norbert Wiener of the Massachusetts Institute of Technology at 4: 30 p.m., Wednesday, December 28. J. L. Walsh, president of the society, presided.

At 10: 00 a.m., Thursday, December 29, President J. L. Walsh conducted the annual business meeting of the American Mathematical Society, at which Secretary J. R. Kline gave his annual report, the officers for 1950 were elected, and the Cole Prize in Algebra was awarded to Richard Brauer of the University of Michigan. Prof. Brauer gave a brief address on the prize-winning paper.

At the 11 section sessions for contributed research papers, 65 papers were presented in person. Fifty-three papers were also presented by title, making a total of 118.

A tea was given for members and guests by Columbia University on Tuesday afternoon. That evening, the Organizing Committee of the International Congress held a meeting. The International Mathematical Congress is to be held in Cambridge, Massachusetts, August 30 to September 6, 1950.

The council of the American Mathematical Society met on Wednesday evening.

A dinner for the three mathematical organizations—the American Mathematical Society, The Mathematical Association of America, and the Institute of Mathematical Statistics—was held on Thursday evening in the dining room of John Jay Hall, Columbia University. The toastmaster, P. A. Smith, introduced the following speakers: George B. Pegram, vice president of Columbia University; J. L. Walsh, president of the society; H. M. MacNeille, executive director of the society; Jerzy Neyman, president of the institute; R. E. Langer, president of the association. M. R. Hestenes offered a resolution of thanks to Columbia University and the Committee on Arrangements adopted it unanimously by a rising vote.

T. R. Hollcroft, *Associate Secretary*

Institute of Mathematical Statistics (A2)

The 41st meeting of the institute (its 12th annual meeting) was held December 27–30, with headquarters at the Biltmore Hotel. The 14 sessions, including council and business meetings, were attended to capacity. A broad range of topic was discussed—ten of the sessions having been held jointly with one or more of the following societies: American Statistical Association, American Mathematical Society, Econometric Society, Psychometric Society, Mathematical Association of America, Association for Computing Machinery, American Psychological Association. Besides the various symposia and sessions of invited addresses there were three sessions of contributed papers—one of them joint with the A. S. A. and the Econometric Society—at which a total of 24 papers were presented. In all respects there was active participation by the membership in the program.

Mathematical Association of America (A3)

The 33rd annual meeting of the association was held at Columbia University on Thursday and Friday, December 29–30, 1949. The Board of Governors met on Thursday afternoon. A joint dinner of the mathematical organizations was held at 6: 30 p.m. on Thursday in the dining room of John Jay Hall, Columbia University.

On Friday morning and afternoon, scientific sessions of the association were held in Room 301, Pupin Physics Laboratories of Columbia University. Speakers were Nicholas Rashevsky, University of Chicago; W. T. Martin, Massachusetts Institute of Technology; Ralph Beatley, Harvard University; C. C. MacDuffee, University of

[1] Key symbols correspond to those in the general programs.

Wisconsin; William Feller, Cornell University; and J. W. Tukey, Princeton University.

L. M. Graves of the University of Chicago was elected first vice president, succeeding Saunders MacLane, also of the University of Chicago. Elected as members of the Board of Governors for a two-year term were M. R. Hestenes of the University of California at Los Angeles and Marie J. Weiss of Sophie Newcomb College. Continuing in office are President R. E. Langer of the University of Wisconsin, second vice president N. H. McCoy of Smith College, and secretary-treasurer, H. M. Gehman of the University of Buffalo.

The association voted to hold its next annual meeting on Saturday, December 30, 1950 at the University of Florida, Gainesville, Florida. In order to avoid a conflict with the International Congress of Mathematicians to be held at Cambridge, Massachusetts, from August 30 to September 6, the usual summer meeting of the association will not be held during 1950.

HARRY M. GEHMAN, *Secretary-Treasurer*

Section on Physics (B)

The presentation of a group of four symposia on "The Present State of Physics" at the annual December meetings of the AAAS was a new and experimental venture. The results encourage the belief that the idea is sound and that such symposia should be a regular feature of the meetings.

The general plan of the symposia was: (a) to invite a systematic presentation of significant research advances in each of four broad fields—elementary particles, physics of the solid state, chemical physics, and biophysics; and (b) to present such material, not in the language of the narrow specialty, but in terms that would be understood by anyone with sound training in physics. This plan was enthusiastically endorsed and the authors who carried it out in such an able and scholarly manner deserve the gratitude of Section B.

Despite the fact that there was little advance knowledge of these symposia, there was a good-sized and responsive audience. Many more will look forward to these symposia now that they have become a regular feature that can be anticipated.

Based upon our experience, a number of constructive suggestions can be made:

1. Each one of the symposia should be planned by a small representative working committee. Since the invitation will constitute something of an honor, precautions should be taken to make the selections fair and impartial. This time, of necessity, the working committee was chosen by the secretary from associates in the vicinity who could be gotten together promptly. The secretary is very much indebted to this committee: Merle Tuve, Kenneth Cole, and Sterling Hendricks. The secretary is also indebted to Karl Lark-Horowitz, General Secretary, for his encouragement and advice in planning the symposia.

2. The interest and support of the American Physical Society and the Institution of Physics should be invited. These symposia are intended to be supplemental to the meetings of the Physical Society where, in contrast, the primary emphasis is placed upon short papers presenting new findings in the briefest possible terms of the specialization. The number of such contributions has grown to surprising proportions, requiring concurrent sessions in several locations. Both types of meetings seem desirable. The broad character of the AAAS makes its meeting a logical occasion for a presentation of symposia to a wider audience.

3. The four symposia should be given in four successive half-day sessions—thus avoiding two symposia in a half-day, with consequent limitation on the number of presentations and the amount of discussion. Three papers and the discussions of them seemed right for a half-day period.

4. There should be a local committee of physicists in the area of the meetings to act as hosts to speakers and guests, and to look after details of projection and other requirements of the symposia. Too much burden fell on one or two people and some details received scant attention.

5. Your secretary invites suggestions and criticisms. We hope that Section B can prove of real service not only to physics but also to the closely related sciences. Our experience in caring for the affairs of Section B and the parent organization is most limited, but we have received the finest cooperation.

FREDERICK S. BRACKETT, *Secretary*

Section on Chemistry (C)

The program of the chemistry section consisted of two unusually good symposia—one on medicinal chemistry, arranged by Robert S. Shelton, and one on recent advances, arranged by George Glockler—as well as a general session, arranged by the secretary. A number of the papers attracted capacity attendance. "Comparative Studies of Antihistaminic Agents," by N. B. Drewer, of the School of Medicine of the University of Vermont, was received after the program was printed. H. S. Booth of Western Reserve University is the newly elected chairman of Section C and one of the vice presidents of the AAAS.

Tentative plans for the 1950 meeting, to be held in Cleveland on December 26 to 30, indicate a day for industrial tours, a day for general submitted papers, and two or three days of timely symposia. It is not too early to begin to plan for this meeting, as all titles and abstracts for papers will be due on or about September 1, 1949. Plan now to attend this meeting in the Midwest.

ED. F. DEGERING, *Secretary*

Section on Astronomy (D)

The section on astronomy met December 28–30. Dean B. McLaughlin, retiring chairman, presided at the Wednesday afternoon session in the McAlpin Hotel. Seven papers were presented. Donald H. Menzel's motion picture on solar eruptions probably had the greatest general interest.

The Thursday morning session met in the Governor Clinton Hotel, with Harlow Shapley presiding until he

was called out to substitute for James B. Conant, who was ill, at another meeting. Dr. Shapley asked Miss Ida Barney to take the chair when he left. Six papers, three on interstellar matter, were presented.

The Thursday afternoon session again met in the Governor Clinton Hotel, with Lyman Spitzer presiding. The feature paper of this session was the address of the retiring chairman of the section, Dean B. McLaughlin, on "Problems in the Spectra of Novae." Seven shorter papers were presented in addition to the address.

The Friday morning session, which also met in the Governor Clinton Hotel, was a symposium on "Statistical Methods in Astronomy," with Walter Bartky presiding. This was a joint session with the Institute of Mathematical Statistics and the American Statistical Association. Six papers were presented.

The attendance was between 100 and 110 for the Wednesday afternoon session, between 50 and 60 for the Thursday morning session, between 65 and 70 for the Thursday afternoon session, and between 80 and 90 for the Friday morning session.

C. C. WYLIE, *Secretary*

Section on Geology and Geography (E)

The sessions of Section E were held in the North Ballroom of the Hotel New Yorker on Thursday and Friday, December 29 and 30. Approximately 160 individuals participated. A general program of four sessions with 33 papers, 30 on geology and 3 on geography, was arranged by W. Storrs Cole, program chairman, and the section secretary. All but two of the scheduled papers were presented. The sessions were presided over by Henry R. Aldrich, W. Storrs Cole, Chairman R. C. Moore, and Johnson Fairchild. The program was notable in that about half of the papers were given by younger men. On December 28, Section E participated with the Society for the Study of Evolution in a symposium on "The Role of the South Atlantic Basin in Biogeography and Evolution, with Special Emphasis on the History of South America During the Mesozoic Era." A special program, including abstracts of papers, was made available through cooperation of The Geological Society of America.

The regular Section elections and Council actions resulted in the following new officers: vice president and chairman, Kenneth K. Landes; retiring vice president, Raymond C. Moore; and elected to the Section Committee, K. E. Lohman.

LELAND HORBERG, *Secretary*

National Geographic Society (E4)

The officers and Board of Trustees of the National Geographic Society were pleased with the arrangements by the AAAS for the first report by Frank M. Setzler on the Arnhem Land Anthropological Expedition, sponsored by the National Geographic Society, the Smithsonian Institution, and the Commonwealth of Australia.

A capacity audience—about 1100—heard Mr. Setzler describe nearly a year's scientific study of the aborigines of remote Northern Australia, who have been seen by few white men and cling to the customs of the Stone Age. The first colored motion pictures out of Arnhem Land illustrating the report showed the aborigines in their search of forests and streams for food, and in their weird tribal rites.

We feel that our part of the program was a great success.

GILBERT GROSVENOR, *President*

American Society of Parasitologists (F1)

At the 24th annual meeting of the society, the following officers were elected: Willard H. Wright, president; H. W. Manter, vice president; H. W. Brown, secretary; Robert M. Stabler, treasurer; and John C. Swartzwelder and George W. Wharton, council members at large.

Attendance at the sessions was approximately 200. In addition to regular sessions devoted to various aspects of parasitology, a symposium on "The Physiology of Parasites" was arranged by the president elect, Willard H. Wright. The presidential address, delivered by retiring president T. W. M. Cameron, was entitled "Osler and Parasitology." R. Barclay McGhee's paper, on the "Infection of the Immature White Mouse with the Avian Malaria Parasite, *Plasmodium lophurae*," was voted outstanding.

The society voted to meet with the AAAS in Cleveland during the Christmas holidays in 1950.

H. W. BROWN, *Secretary*

The Society of Systematic Zoology (F4)

The society held its second annual breakfast and business meeting on December 29 in New York City. The result of the election of officers was announced as follows: president elect, Carl L. Hubbs; secretary-treasurer, R. E. Blackwelder; councillors, K. P. Schmidt and G. F. Ferris.

The society is engaged in numerous activities designed to benefit taxonomists, including improving publication outlets and abstracting journals, circulation of useful information, elimination of abuses and misconceptions, and standardization of procedures and terminologies.

A membership of 531 was reported, and a goal of 1000 members was confidently set.

R. E. BLACKWELDER, *Secretary-Treasurer*

The American Microscopical Society (FG1)

The society held its 66th annual meeting during the week of December 26–31. The annual Executive Committee luncheon was held in Parlor B, Hotel Statler, on Tuesday, December 27, with President Clarence E. Taft, of Ohio State University, presiding. Following the luncheon, the business meeting of the committee continued until 4:30 in the afternoon.

The annual business meeting of the society was called to order by President Taft at 4:00 p.m. in Parlor 2 of the Hotel Statler, on Friday, December 30. The meeting was well attended and much business of interest to the members and importance to the society was transacted. Details will be reported in the annual proceedings, which will appear in the January issue of the *Transactions*. Among other items of business were amendments to the constitution and the bylaws, bringing

the rates for membership and subscriptions into line with the present costs of publication.

Officers elected for 1950 are: president (one year) Asa C. Chandler, The Rice Institute; first vice president (one year) David Chandler, Cornell University; second vice president (one year) Theodore L. Jahn, University of California at Los Angeles; treasurer (three years) A. M. Chickering, Albion College; custodian (three years) James E. Ackert, Kansas State College; elective executive committeeman (three years) Clarence V. Bangham, College of Wooster. Other officers whose terms carry over through 1950 are: elective committeemen, O. W. Richards, American Optical Company; A. B. Dawson, Harvard University; Spencer-Tolles committeemen; James E. Ackert, chairman; L. E. Noland, University of Wisconsin; and C. E. Taft, Ohio State University; secretary-editor, F. E. Eggleton, University of Michigan.

The Executive Committee recommended and the society approved the initiation of a limited program of invitation papers to be read at the 1950 meeting of the society. Not since the early days of the society has a program of papers been presented at the annual meeting. The present plan is being initiated on an experimental basis. It is hoped that the response of members, as indicated by communications to the secretary and, in particular, by attendance at the program, will justify its continuance.

FRANK E. EGGLETON, *Secretary-Editor*

The American Society of Human Genetics (FG2)

The society held its second annual meeting December 28–30. A large percentage of members was present. The short papers were excellent, as was the retiring presidential address of H. J. Muller, entitled "Our Mutations." The officers for 1950 are: president: L. H. Snyder, University of Oklahoma; vice president, Curt Stern, University of California at Berkeley; and secretary-treasurer, Herluf H. Strandskov, University of Chicago; AAAS Council member, C. P. Oliver, University of Texas. Elected to the Board of Directors for a two-year period were: R. C. Cook, Philip Levine, and Bronson Price. Serving one more year on the Board are: J. B. Birdsell, J. V. Neel, and C. P. Oliver. The first issue of the journal of the society, *The American Journal of Human Genetics*, appeared late in 1949. The first volume will consist of two issues. The 1950 and later volumes will consist of four issues each. The editor is C. W. Cotterman, University of Michigan.

HERLUF H. STRANDSKOV, *Secretary-Treasurer*

The American Society of Limnology and Oceanography (FG3)

The society held its 12th meeting December 28–30. The sessions on the first day took place at Columbia University, where papers on the special topic of "Apparatus and Methods" were presented in the morning. The afternoon session consisted of a joint meeting with the Ecological Society of America. The remaining sessions were held in the Governor Clinton Hotel with more than 100 members in attendance.

At the annual business meeting of the society, A. D. Hasler, University of Wisconsin, was elected president, E. S. Deevey, Yale University, vice president, and T. S. Austin, U. S. Navy Hydrographic Office, Washington, D. C., secretary-treasurer.

With the expansion of the scope of the society to include all aspects of limnology and oceanography, as announced last year, the enrollment has grown to a current total of 865 members. All official correspondence should be addressed to the new secretary-treasurer.

THOMAS S. AUSTIN, *Secretary-Treasurer*

The American Society of Naturalists (FG4)

The society met with the AAAS in New York, December 29 and 30. The well-attended Biologists' Smoker was held in the American Museum of Natural History through the kindness of its director, A. E. Parr. The society presented a symposium on "Reproduction in Plants," organized by its vice president, K. V. Thimann. The retiring president, T. M. Sonneborn, presented a very careful analysis of the recent genetic controversy under the title "Heredity, Environment and Politics."

WILSON S. STONE, *Secretary*

Beta Beta Beta (FG5)

The Beta Beta Beta Biological Fraternity held its convention luncheon December 27 at the Hotel Martinique. Tracy M. Sonneborn, of Indiana University, delivered the convention address on the subject "Parameecium in Modern Biology." The plenary session of the society was held Tuesday afternoon.

F. G. BROOKS, *Secretary*

Biometric Society (FG-6)

The Eastern North American Region held its annual meeting December 28–30, jointly with the Biometrics Section of the American Statistical Association. The first session, under the chairmanship of Horace W. Norton, concerned the use of rationally developed equations in biology with papers by S. E. Luria on "An Interpretation of the Formation of Active Bacterial Virus from Ultraviolet Inactivated Virus" and by Elliot V. Newman and Margaret Merrell on "The Application of Equations Derived from Models to 'Central' Circulatory Volume." The following day a session on long-time follow-up in morbidity studies was chairmaned by John W. Fertig and included papers by Paul M. Densen on "The Definition of the Group to be Followed;" T. E. Harris, Paul Meier, and John W. Tukey on "Timing of the Distribution of the Events Between Observations;" and by Harold F. Dorn on "Methods of Analysis in Follow-up Studies." The closing session under the chairmanship of Frederick Mosteller consisted of contributed papers by Joseph Berkson on "Relative Precision of Minimum X^2 and Maximum Likelihood Estimates of Regression Coefficients, with Particular Reference to Bioassay;" Jane Worchester, and S. S. Stevenson on "Malformations at the Boston Lying-in Hospital, 1930–1941;" W. J. Youden on "A Statistic for Rating Diagnostic Tests;" and

by S. W. Greenhouse and Nathan Mantel on "The Evaluation of Diagnostic Tests." All sessions were characterized by active discussions, both by announced discussors and by members attending the meeting.

At the business meeting of the region on December 30, there were reports on the sessions held by the region during 1949 and those planned for 1950 and brief reports of the International Conference at Geneva. A membership committee was approved, the financial status of the region reviewed, and the following officers elected for 1950: vice president, Joseph Berkson; secretary-treasurer, Walter T. Federer; members of the regional committee for 1950–52, Lila F. Knudsen and W. J. Youden.

C. I. BLISS, *Secretary*

The Genetics Society of America (FG9)

The society arranged a program for the presentation of scientific papers and for the annual luncheon and business meeting. At the various sessions, 97 papers were presented including 64 short papers; one session devoted to a program of six papers selected for a more extended presentation; 19 presented as demonstrations and eight read by title.

Because of the large number of papers to be presented at these meetings, concurrent sessions were necessary on Wednesday and on Thursday afternoon. The luncheon was held Thursday noon at the Men's Faculty Club at Columbia University, followed by the business meeting at which more than 175 persons were in attendance.

The sessions were noteworthy for the great variety of papers given at the regular sessions. Papers dealing with genetic phenomena in microorganisms, population genetics, genetic effects of radiation, cytogenetics, and mutations were particularly outstanding in the program.

Members participated with those of other societies in symposia on "Experimental Cell Research" and "Reproduction in Plants," with Sections G and FG in a panel discussion on "Botany in the Service of Man," and with Section F on "Sex Differentiation in Vertebrates."

The following officers were elected for 1950: president, Curt Stern; vice president, M. R. Irwin; secretary-treasurer, W. Ralph Singleton.

M. R. IRWIN, *Vice President*

The Society for the Study of Evolution (FG11)

The society held its fourth annual meeting at Columbia University, the third meeting in conjunction with the AAAS. The program consisted of 42 papers presented in five sessions. Of special interest, not only to the society but to other societies of Sections E, F, and G, was the two-session symposium on "The Role of the South Atlantic Basin in Biogeography and Evolution," organized by President Norman D. Newell. The SSE has endeavored to avoid concurrent sessions and to spread its program over the whole period of the meetings with selected half-day periods open, in order to reduce major program conflicts. However, the vigor with which the programs of this young society are developing, may soon preclude such arrangements. Because the membership of the SSE includes persons belonging to societies that do not usually meet with the AAAS, it is contemplated to meet with the AAAS only in alternate years.

STANLEY A. CAIN, *Secretary (retiring)*

Section on Botanical Sciences (G)

Section G held only one session, a panel discussion on "Botany in the Service of Man," which was organized by the section secretary and held jointly with the societies of Sections G and FG. William C. Steere was moderator of the discussion and the panel was composed of Hazel K. Stiebeling, S. T. Dana, Gove Hambidge, K. A. Ryerson, and Frans Verdoorn. The panel members not only pointed out the many ways in which botany is of service to man and fundamental to many specialized sciences and human institutions and activities, but emphasized the role the plant sciences must play in international fields if man's aspirations to build a permanent peace are to have hope of success.

Nine societies associated with Section G held programs, individually or jointly. They were: American Bryological Society, American Fern Society, American Phytopathological Society, American Society of Plant Physiologists, American Society of Plant Taxonomists, Botanical Society of America, Mycological Society of America, Phycological Society of America, and the Torrey Botanical Club. These societies collectively presented 117 sessions, of which 25 were major joint programs of two or more organizations. Fourteen sessions were devoted to society affairs (council and business meetings), nine were banquets or other social affairs, and 48 were formal sessions for reading of contributed papers. In addition there were 21 programs of special type, including symposia, panel and conference discussions, and demonstrations.

The botanical sciences were also involved in the various programs of the broad biological societies of FG. The 13 organizations presenting programs of interest to both zoological and botanical scientists were: American Microscopical Society, American Society of Human Genetics, American Society of Limnology and Oceanography, American Society of Naturalists, Beta Beta Beta, Biometric Society, Biometric Section, Ecological Society of America, Genetics Society of America, National Association of Biology Teachers, Society for the Study of Evolution, American Institute of Biological Sciences, and the Society of Industrial Microbiologists.

The American Society of Human Genetics, which was organized at Washington in 1948, held its first full-dress program meeting, with two sessions for technical papers and one demonstration session. The Society of Industrial Microbiologists (tentative name) held its organizational meeting on December 29. It is planned for the society to cover fields such as deterioration and preservation of military and industrial materials, microbiological manufacturing processes, microbiological assay, fungicides, etc. The largest society program of Section G was that of the Botanical Society of America, with 26 sessions for papers, 10 symposium-type programs, and other

meetings of a business or social nature, before which were presented more than 250 technical papers and speeches.

STANLEY A. CAIN, *Secretary*

The American Bryological Society (G1)

The society breakfast was held in the Marine Grill, McAlpin Hotel, December 27. At the business meeting which followed in El Patio, the new constitution was adopted and officers were elected for the next two years: president, Lewis E. Anderson, Duke University; vice president, Geneva Sayre, Russell Sage College; and secretary-treasurer, Winona H. Welch, DePauw University. The place and the dates of the future meetings will be in accord with those of the Botanical Society of America. The Executive Committee meeting was held at the luncheon hour in the Marine Grill.

Thirteen papers were presented at the morning session, President Paul M. Patterson, presiding. A symposium, "The Bryologist and the Development of Bryology in North America," composed the afternoon program.

The American Bryological Society joined the taxonomic section of Botanical Society of America in the Wednesday sessions at the New York Botanical Garden.

WINONA H. WELCH, *Secretary-Treasurer*

The American Phytopathological Society (G3)

The society held its 41st annual meeting at the Hotel Martinique, on December 28, 29, and 30. The northeastern division met with the parent society. Business meetings were held on December 28 and 30. The council met on December 27, and again on the 28th. On the afternoon of December 30, a joint session was held with the Mycological Society of America. Four hundred and twenty-five members registered. One hundred and sixty-two papers were scheduled in 14 sessions, and four symposia. Conferences and symposia were held under the following titles: "Stone Fruit Virus Diseases," "Extension Work in Plant Pathology," "The Teaching of Plant Pathology," "Fungicide Colloquium," "Plant Disease Forecasting," "Performance of New Fungicidal Sprays and Dusts in Cooperative Regional Experiments Conducted in 1949," and "Outlook for Cooperative Regional Projects in Plant Pathology under the Research and Marketing Act." A trip was scheduled to the Foreign Plant Quarantine Inspection House of the U. S. Department of Agriculture at Hoboken, New Jersey. Inspection and treatment methods were observed and quarantine problems discussed. One hundred and forty-nine applicants were accepted as members of the society.

CURTIS MAY, *Secretary*

American Society of Plant Physiologists (G4)

The 24th annual meeting of the ASPP was held December 26–31. Meeting jointly with the Physiology Section of the Botanical Society of America, the society heard and discussed approximately 90 submitted papers. Subjects most frequently represented in the discussion were the physiology and chemistry of the plant growth substances, tissue culture studies of growth and differentiation, the biochemistry of plant enzymes and respiratory mechanisms, floral initiation and photosynthesis.

Two symposia were held, one on plant tissue culture as a technique for elucidating problems in plant physiology, the other on reproduction in plants. Participants in the tissue culture symposium stressed the definition of the growth factors of plants and the recent advances in our understanding of differentiation and organogenesis achieved by the tissue culture technique. The discussion after the symposium on reproduction in plants was most stimulating because of the presence of numerous zoologists, who demonstrated their eagerness to apply recent advances in photoperiodism and environmental control of plants to their particular field.

The annual dinner meeting of the society was well attended, and featured talks by D. B. Anderson, retiring president, and by David R. Goddard, winner of the 1948 Stephen Hales prize for achievement in plant physiology.

JAMES BONNER, *President*

The Botanical Society of America (G6)

The 44th annual meeting of the society on December 26–30 was the largest in its history, with over 700 members in attendance. Forty-eight sessions were held by the six sections with a total of 306 papers presented. Twenty-three of these sessions were held jointly with other plant science societies. At the annual banquet on Thursday evening, December 29, J. C. Clausen, W. M. Hiesey and D. D. Keck of the Carnegie Institution of Washington, Stanford, California were awarded the Cranbrook Institute of Science Mary Soper Pope Medal for distinguished accomplishments in botanical science.

The officers elected for 1950 are A. F. Blakeslee, Smith College, president; John S. Karling, Purdue University, vice president; Harriet B. Creighton, Wellesley College, secretary, and W. H. Camp, Philadelphia Academy of Natural Sciences, member of the editorial board.

JOHN S. KARLING, *President*

The Mycological Society of America (G7)

The society met at the Hotel McAlpin, jointly with the Microbiological section of the Botanical Society of America and the American Phytopathological Society. The papers presented accented the changing emphasis in the field of mycology from that of taxonomy and morphology of the fungi to that of physiology and medical mycology. Seventy-two papers were presented in the following fields: general 4, taxonomy 11, geographic distribution 3, morphology 3, medical mycology 9, physiology 24, cytology and genetics 11, industrial mycology 5.

JOSEPH C. GILMAN, *Secretary*

Torrey Botanical Club (G9)

Ninety members and guests attended the special luncheon of the club held on December 29 at the Hotel McAlpin. It was a gathering more representative of the membership than is usually possible, for the club now has nearly 800 members, not more than a quarter of them resident in the New York area where regular meetings

are held. The president, Edwin B. Matzke, gave a brief outline of the club's history and activities before introducing the speaker, W. H. Camp, of the Academy of Natural Sciences, Philadelphia.

JENNIE L. S. SIMPSON, *Corresponding Secretary*

Section on Anthropology (H)

Section H held three sessions this year, and one session jointly with Sections I, K, N, and Q.

A general session on social anthropology came on the first afternoon of the meetings and, since this happened to be the only session scheduled for that time, Section H had the honor of starting off the long list of scientific papers which marked the sixth New York program. Speakers at this session came from Adelphi College, Brooklyn; Temple University, Philadelphia; the University of Pennsylvania; Principia College, Elsah, Illinois; and the University of California, Los Angeles. The session was admirably led by the Section's chairman, Wilton M. Krogman.

Possibly the main feature of the Section H program was the full-day symposium on "Mind, Culture and Individuality." Twentieth century investigations of man's behavior have somewhat overemphasized its automatic and nonintellectual aspects, and this symposium aimed to bring together persons from various disciplines who are more peculiarly aware of the effects of man's cognitive powers on his actions. The papers took the form both of reviews of research over the past decades and of ideas for and contributions toward future work. Philosophy, psychology, oriental studies, and anthropology were represented. The morning session was chairmaned by Horace L. Friess (Columbia University) and the afternoon session by Margaret Mead (American Museum of Natural History). Participants were Joseph Bram (New York University), Wayne Dennis (University of Pittsburgh), A. Irving Hallowell (University of Pennsylvania), Samuel N. Kramer (University Museum, Philadelphia), Dorothy D. Lee (Vassar College, Poughkeepsie, New York), S. Stansfeld Sargent (Barnard College, New York City), Marian W. Smith (Columbia University), and Laura Thompson (Institute of Ethnic Affairs, Washington, D. C.). The symposium was more successful than the most sanguine of us had dared predict and it demonstrated again the value of, and demand for, cross-disciplinary approaches to scientific problems.

In view of the fact that this was the third major group of meetings in anthropology to be held in New York City in the fall and winter of 1949, attendance figures are of rather unusual importance. The International Congress of Americanists met in New York City in September and was attended by a large group of scholars from all parts of the world, and the annual meetings of the American Anthropological Association, which were held in New York City in November, drew, as they always do a number of anthropologists from this country. Yet attendance at Section H meetings ran from 100 to well over 250, and it may be estimated that some 400 persons attended sessions. These unusually high figures indicate not only that New York City was well chosen as a meeting place but also, since by no means all attendants and participants came from the eastern seaboard, that what seems a repetition of meetings does not necessarily mean a decrease in either attendance or interest. As so many of us have suspected, the more work is done, the more appetite there is for further work.

MARIAN W. SMITH, *Secretary*

The Academy of World Economics (K1)

The academy, in joint session with Section K, concluded its project for the year 1949 of research dealing with the general subject of aid to underdeveloped areas of the world. The April sessions of the academy, held at the Brookings Institution in Washington, D. C., developed this subject from an expositive point of view. The December session, held jointly with Section K at the Hotel Governor Clinton, explored the subject from the viewpoint of the inherent limitations contained in the governmental proposal of technical and financial aid to foreign areas. It was not the purpose of this session to be critical, but rather to explore and examine problems which might hinder the successful operation of the foreign aid plan.

In terms of purpose, academy officers concluded the New York session was an outstanding success. Edgar S. Furniss, Jr., assistant professor of politics at Princeton University, developed the subject in its relation to Latin America. Arthur R. Burns, professor of economics at Columbia University, analyzed the economic problems of the program, and John P. Shea, Department of Agriculture, approached the subject from the fields of ecology and sociology. Analyses through the disciplines of economics, political science, and sociology left few aspects of the general subject undeveloped. Benjamin H. Williams, Industrial College of the Armed Forces and board chairman of the academy, presided at the session. Dr. Williams is a specialist in the field of technology and international relations.

The proceedings of the New York session will be published in the June issue of the journal of the Academy, *Social Science*, and will be under the special editorship of Donald P. Ray.

DONALD P. RAY, *Executive Secretary*

Pi Gamma Mu (K8)

In accordance with its custom of many years, the national social science honor society, Pi Gamma Mu, held a luncheon immediately following the joint session of the Academy of World Economics, with which Pi Gamma Mu collaborated, and the sections on social and economic sciences of the AAAS, on December 28, 1949. The informal luncheon, in the Greeley Room of the Hotel Governor Clinton, honored officers of the Academy of World Economics; Section K, Section L, Section H, and Section Q.

S. Howard Patterson, professor of economics in the University of Pennsylvania, national president of Pi Gamma Mu, presided, assisted by Horace Taylor, professor of economics in Columbia University, national first vice president of Pi Gamma Mu.

The guest list included: Benjamin H. Williams, chair-

man of the board of the Academy of World Economics; Francis D. Curtis, chairman of Section Q; D. A. Worcester, secretary of Section Q; Arthur R. Burns, speaker on the joint session; John Penfield Shea, speaker; J. Laurence Phalan of the U. S. Office of Education; Marian W. Smith, secretary of Section H; Dorothy Porter Isom; William W. Martin, national second vice president of Pi Gamma Mu; Eugene H. Miller, governor of the Pennsylvania Province of Pi Gamma Mu; Paul J. FitzPatrick, national treasurer of Pi Gamma Mu; Andrew J. Kress, chancellor of the Atlantic Region of Pi Gamma Mu; Mabel Newcomer; Charles W. Shull, book review editor of *Social Science*; Edward W. Carter, editor of *Social Science*; Effie B. Urquhart, national executive secretary of Pi Gamma Mu; James J. Hayden, general counsel of Pi Gamma Mu; W. Leon Godshall, chancellor of the Eastern Region of Pi Gamma Mu; Robert D. Seltzer; Mrs. S. Howard Patterson; Conrad G. D. Maarschalk; Arthur W. Angel, lieutenant governor of the Michigan Province of Pi Gamma Mu; Ardath W. Burks, and Vladimir Anderson Dupre.

The Rural Sociological Society (K9)

The society had a well-attended, enthusiastic meeting which spilled over into very extended rump sessions on methodology of research problems. The thesis this year was regional rural problems from the Old South through the arid west to the large farms, irrigation and population problems of the Pacific States. Next meeting was voted to be held in Colorado in September, either at Denver or at Fort Collins or partly at both. Newly elected president is C. Horace Hamilton, North Carolina State College, Raleigh, North Carolina.

CARLE C. ZIMMERMAN, *President*

Section on History and Philosophy of Science (L)

Section L met jointly with the American Philosophical Association and the Philosophy of Science Association. There were four meetings. The first meeting was held on the problems of the history and sociology of science. Dirk J. Struik, of the Massachusetts Institute of Technology, talked on the problems of the history of mathematics and emphasized the interrelationship of social and political events with mathematical discovery. Frank Hartung, Wayne University, talked on sociology of knowledge, and criticized Karl Mannheim's "Ideology and Utopia." In particular, Prof. Hartung attacked Mannheim's concept of the "free floating intellectual."

In the second meeting, R. von Mises of Harvard University criticized the extra-sensory perception experiments conducted at Duke University. Prof. von Mises argued that the validation of the existence of E.S.P. could occur only after very extensive experimentation and that the data available to date did not confirm the existence of E.S.P. Joseph Rhine of Duke University replied that he and his group had never claimed the existence of E.S.P. but only its occurrence in certain individuals at certain times. At this session, Charles Morris of the University of Chicago, presented his theory of the relationship of the choice of a path of life and the physical characteristics of the individual (as explained, for example, in the work of Kretchmer and Sheldon).

In the third meeting, Ernst Kris of Yale University discussed the problem of research in psychoanalysis. Karl Deutsch of M.I.T. discussed the role of models in social science research and Walter Pitts of M.I.T. explained some of the recent work in the field of cybernetics. Prof. Pitts talked about the relationship between the conclusions of cybernetics and some of the traditional problems of philosophy.

At the last session, Bernhard Stern of Columbia University criticized certain modern geneticists for incautious statements concerning pure and impure stock among humans. Th. Dobzhansky of Columbia University outlined a contemporary theory of genetics as accepted by many geneticists of this country. There followed a discussion of the Russian and American genetical theories.

As the titles and the names of the participants make clear, Section L is becoming an increasingly important forum where those working on the growing edges of science meet for the clarification and assessment of their sorties over the existing borders of knowledge. This interpenetration of scientific imagination and philosophical scrutiny indicates a healthy vigor of contemporary thinking on basic issues. The sessions were lively and well attended.

C. WEST CHURCHMAN, *Secretary of the Philosophy of Science Association*, and CHARLES W. MORRIS, *Chairman of Section L*

Section on Engineering (M)

The activities of Section M for 1949 centered around the annual meting of the AAAS. The general policy of the section is to encourage joint activities of the various affiliated societies. With this point in view, letters were sent to the affiliated engineering societies in January 1949, inviting them to take part in developing the program for our annual meeting.

A favorable reply was received from the New York Section of the American Institute of Electrical Engineers and a three-day program was developed. This program, under the chairmanship of I. E. Lattimer of the American Telephone and Telegraph Company, had for its topic "Television," and consisted of a three-day display of television equipment and two symposia on the technology and development of television. Over 3000 visitors registered at the television display and the technical sessions drew about 150 members at each session.

A symposium on nuclear engineering was presented Tuesday evening, through the cooperation of the Newark College of Engineering, Newark, New Jersey. Irving P. Orens, representing the college, was the chairman of the meeting. The program consisted of three excellent papers on nuclear engineering and a paper on "Research in Great Britain," presented by W. R. Woolrich, retiring chairman of the section. The meeting was attended by 215 members.

The annual business meeting of the Committee of Section M was held on Tuesday morning, with the follow-

ing members present: W. R. Woolrich, chairman; F. D. Carvin, secretary; J. I. Yellott, B. A. Bakhmeteff, R. S. Swinton, and G. E. Pendray.

The following officers and committeemen were elected: vice president and section chairman, Morrough P. O'Brien (1950) University of California at Berkeley; secretary, Frank D. Carvin (1952), Illinois Institute of Technology, Chicago; Executive Committee: Boris A. Bakhmeteff (1950), New York City, John I. Yellott (1951), Baltimore, Irving P. Orens (1952), Newark, New Jersey, and G. Edward Pendray (1953), New York City.

The annual meeting of the Association for 1950 will be held in Cleveland, Ohio, December 26–31, 1950. It will consist of section meetings for the first three days and general symposia for the last three days. The following topics were suggested for program material for the 1950 meeting:

1. Social Physics as applied to Industrial Expansion.
2. Symposium on Nuclear Engineering.
3. Study of Water Supply as related to Industrial Expansion.
4. Industrial Research Developments.

All affiliated societies of Section M are invited to take part in the meeting.

Section M has been invited by the American Society of Mechanical Engineers to sponsor jointly several of the programs to be presented at the annual ASME meeting to be held in New York City during the week of November 27, 1950. The section is glad to accept this invitation.

FRANK D. CARVIN, *Secretary*

Section on Medical Sciences—Subsection on Dentistry (Nd)

Of three sessions held, the first was devoted to a symposium dealing with histo- and cytochemical studies of teeth and oral tissues. The topics discussed consisted of general studies on normal and carious teeth, phosphatase localization in relation to growth and calcification, radioautographic visualization of tooth development, and factors occurring in gingivitis, with special reference to the distribution of mucopolysaccharides in the gingival tissues.

The afternoon session was of a more varied nature. Papers presented dealt with such varied topics as eruption, genetic abberations, studies in the mechanism of calcification, proteins in saliva, and several other aspects of dental science.

The main feature of our evening session consisted of a dinner at which William Gies, founder of the *Journal of Dental Research*, gave a short address in which he reviewed the history of dentistry and its growth in cognate basic science researches.

In general, the meetings were widely representative, of very high caliber scientifically, and well attended (estimated attendance 125 at morning and afternoon sessions). The discussions were lively, provocative, extremely interesting and informative.

G. BEVELANDER, *Local Program Chairman*

Section on Medical Sciences—Subsection on Medicine (Nm)

Twenty-four outstanding investigators in the field of experimental and clinical endocrinology participated in a symposium on the adrenal cortex sponsored by section Nm. Although conferences on adrenal physiology have been held frequently in the past few years, the progress in this field of endocrinology has been so rapid and popular interest so high that the symposium drew overflow audiences at all four sessions. The first session was devoted to papers on the regulation of adrenal cortical activity, the second and third to metabolic effects of the cortical hormones, and the fourth to the relation of adrenal cortical activity to disease states. It is hoped that the papers will be published soon in a symposium volume.

Additional features of the section program were the presentation of the Theobald Smith Award to Seymour Kety of the University of Pennsylvania for his studies on human cerebral blood flow, and the vice presidential address by Alan Gregg of the Rockefeller Foundation. Dr. Gregg discussed the merits of travel in the training and development of the scientist.

On behalf of the section committee, the secretary wishes to thank the many who assisted in developing the program, and particularly the participants for their excellent contributions.

GORDON K. MOE, *Secretary*

Section on Agriculture (O)

The symposium sponsored by Section O on the subject "Whither Soil Conservation" attracted an audience of varied interests, including, among others, foresters, geographers, horticulturists, soil scientists, and representatives of fertilizer companies. The total attendance was approximately 95. Probably the reputations of the speakers—H. H. Bennett, W. Vogt, H. W. Hannah, and E. Truog—attracted some listeners as much as the subject under discussion. The optimistic view of the problem, supported by citation of the great public interest in soil conservation and the high percentage of American farms now included in conservation districts, was tempered by a pessimistic note based on the large number of farms where conservation practices are not in use. The expansion of interest in soil conservation and the adoption of erosion control practices in most areas of the United States has come in the last fifteen years. The role of soil fertility in a conservation program was explained and attention was called to some of the laws in force in many states which may impede the accomplishment of a complete soil conservation program.

The presentation of the program earlier in the week would probably have increased the attendance.

C. E. MILLAR, *Secretary*

Section on Education (Q)

The program of Section Q consisted of a symposium sponsored by the section, and including representatives of the fields of anthropology, psychology, sociology,

medicine, and education; one session of general papers; and an evening session, at which the vice presidential addresses of Sections I and Q were given and the tribute to E. L. Thorndike, a former president of AAAS, was presented.

The meetings were unusually successful. The speakers of the symposium had each received, before the time of the meeting, an outline of what the others were proposing to say, so that there was a meeting of minds. The papers were all of high quality, and were followed by a spirited discussion among symposium members and between the symposium participants and persons in the audience. There were some 300 in attendance. The quality of the afternoon and evening programs was unusually high, and the attendance better than it usually has been. There were about 60 present for the afternoon meeting, and about 100 for the evening meeting. The meetings of this section received an unusual amount of publicity.

The meetings of the subsection on the teaching of science attracted wide interest and large attendance. There is an increasing interest among members of affiliated societies of Section Q; and it is anticipated that at the Cleveland meeting, there will be even a wider participation than there was at this time.

D. A. WORCESTER, *Secretary*

Science Teaching Societies (Q)

With the encouragement of the AAAS Committee on the Teaching of Science and Mathematics, the following groups met both jointly and individually during the three-day session December 27–30: American Nature Study Society; National Association of Biology Teachers; National Science Teachers Association; National Council of Teachers of Mathematics; Junior Scientists' Assembly; Conference on Industry-Science Teaching Relations.

In three joint sessions, reports were presented by outstanding authorities on trends in research, such as the transuranium elements (Quill), hormones (Domm), agriculture (Stakman), vitamins (Mushett), antimicrobial agents (Hobby), blood hormones (Charipper). More general discussions concerning science in general education, and science as a humanity, were introduced by Sears, Meister, Lark-Horovitz, Shapley, and others, followed by numerous brief comments from the floor.

Each of the cooperating groups held three separate programs, featuring special interests such as a demonstration of expert glass blowing (Baker), nature photography (Cruickshank, Teale, Platt, Baldwin), dental health (Strausser), outdoor laboratories (Subarsky), and many others.

The Third National Conference on Industry-Science Teaching Relations was held with discussion of business-sponsored teaching aids by Surface, Carleton, and Read. An exhibit of nearly one hundred units of value for teaching science was set up. Most of these were prepared by science students, and came from various cities in the nation. One display came from California.

The Fourth Annual Junior Scientists' Assembly offered an interesting program featuring young people who are entering careers in science. A high light of the cooperative meeting was the joint banquet of the Science Teaching Societies, at which Karl Lark-Horovitz, AAAS general secretary, was toastmaster. William Jansen, superintendent of the New York City Public Schools, gave the welcoming address. The feature of the evening was a demonstration by J. O. Perrine of the American Telephone and Telegraph Company, who showed many phenomena of the microradio waves now used for radiotelephony and television.

Field trips and tours to places of scientific interest in and near New York City featured the fourth day of the meeting.

HANOR A. WEBB, *Secretary, National Science Teachers Association*

American Nature Study Society (X1)

A series of stimulating, practical talks on nature writing and nature books, by Raymond T. Bond, Roger Tory Peterson, Ellsworth Jaeger, and Howard Zahnizer, were a feature of this year's annual meeting. They set off one of the liveliest discussions in the society's history. As a result, a nature book committee was established to review manuscripts and choose twelve outstanding nature books each year.

Overflow crowds attended this session and the following program on nature photography. On the panel were Allan D. Cruickshank, Edwin Way Teale, Rutherford Platt, and S. Glidden Baldwin. Salon prints, Kodachrome slides and movies illustrated the series of talks.

As successful as the 1948 Christmas trip to the Indiana Dunes was the 1949 foray to Jones Beach on the south shore of Long Island. Led by Edwin Way Teale, Roger Tory Peterson, E. Laurence Palmer, Richard H. Pough, and Richard L. Weaver, 90 persons turned out on a cold, clear morning in hope of seeing snowy owls. They were not disappointed, since at least four of the big white owls were sighted.

At the annual business meeting at the New Yorker Hotel, the reelection of President Richard W. Westwood, Editor of *Nature Magazine*, was announced. Vice president for 1950 will be Eva Gordon, and Richard L. Weaver will serve the second year of a two-year term as secretary-treasurer. New directors, elected for two-year terms, are Marie Gaudette, Roger Tory Peterson, Dorothy Treat, William Vinal, and Arthur R. Whittemore.

The American Nature Study Society cooperated with the National Association of Biology Teachers and the National Science Teachers Association in arranging two joint sessions dealing with recent developments and trends in science, and in sponsoring a joint annual banquet, on December 29. Next year's meeting will be held in Cleveland, with the AAAS.

RICHARD L. WEAVER, *Secretary-Treasurer*

Scientific Research Society of America (X5)

The first annual convention of delegates from branches and clubs of the RESA was held at the Hotel Statler, New York on December 26th. The Director reported six

groups established during the first year of the society's history and a total membership of over a thousand. The Society sponsored a public lecture by J. R. Danning of Columbia in the Statler Ballroom on the evening of December 26, with an attendance of 750.

DONALD B. PRENTICE, *Director*

Conference of State Academies of Science (X8)

The conference was concerned this year with the problems of science as a whole. At the morning session we heard Howard A. Meyerhoff, Administrative Secretary of the AAAS, discuss the present status of the National Science Foundation in the Congress and W. A. Macfarlane describe the organization of science in the United Kingdom. The papers were preceded by a brief statement of the foundation and the conference objectives.

At the afternoon session Watson Davis discussed "A National Program for the Science Talent Search." He described the program of the Science Talent Search and told of the subsequent records made by former winners in it. He also emphasized the great value of the Science Fairs which have been conducted in a number of states. Philip N. Powers then discussed "The Changing Manpower Picture."

The afternoon papers were followed by a paper by Mrs. Madeleine Coutant, who described Hartwick College's work on the Science Fair program. Demonstrations of the projects of winners in the fairs followed.

At the evening dinner William G. Pollard of the Oak Ridge Institute for Nuclear Studies, discussed the Atomic Energy Program in the Associated Colleges. Dr. Pollard's paper was a most fitting climax to an excellent program of the Academy Conference. Mimeographed copies of all papers are being sent to those who attended the conference and to the various secretaries of the state academies of science.

AUSTIN R. MIDDLETON, *Secretary*

Technical Papers

Effect of Whole Body X-Radiation and of Intraperitoneal Hydrogen Peroxide on Mouse Liver Catalase[1]

Robert N. Feinstein, Carrie L. Butler, and Daniel D. Hendley

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It is well established (*6*) that ionizing radiations produce hydrogen peroxide in aqueous media. Because of the known toxicity of hydrogen peroxide, it seemed possible that this might represent at least a portion of the mechanisms responsible for biological radiation damage. An important consideration in opposition to this hypothesis is the wide distribution of the very active enzyme catalase, which rapidly destroys hydrogen peroxide. We have now shown that hydrogen peroxide, known (*8*) to destroy catalase *in vitro*, also destroys liver catalase when injected into intact mice, and that x-radiation of whole mice also brings about a sharp reduction in the catalase activity of the liver.

Mice used were Carworth Farm males, fed a standard diet. They were x-rayed at a rate of about 17 r per min, for a total dose of 800 r. Hydrogen peroxide was injected in the amount of 20 milliequivalents (340 mg) per kg, as an approximately 4% solution. Mice, the same age and weight, injected with 0.2 ml of normal saline, served as controls for the H_2O_2-injected animals. Untreated mice of the same age and weight served as controls for the x-radiation group.

TABLE 1

EFFECT OF INTRAPERITONEAL HYDROGEN PEROXIDE ON MOUSE LIVER CATALASE

Time after injection	Catalase units per mg protein	% Decrease
(No H_2O_2)	4.1	..
2 Minutes	2.8	32
1 Hour	2.5	39
2 Hours	2.4	41
26 Hours	3.0	27
45 Hours	2.3	44
1 Week	3.8	7
2 Weeks	2.8	32
3 Weeks	4.4	−7
4 Weeks	3.7	10

Catalase was assayed by the method of one of the authors (*2*). Protein was determined by a modification (*5*) of the biuret method of Robinson and Hogden (*7*). Two separate mice were used, and the results were averaged, for each value in the tables. Previous tests had shown that 20 meq. of H_2O_2 per kg was slightly less than the LD_{50}, while 800 r of x-rays was well above the 30-day LD_{50}.

Table 1 shows the effect of hydrogen peroxide on liver catalase. Of particular interest is the very rapid decrease in activity, and the slow recovery.

Table 2 shows the effect of whole body x-radiation on liver catalase. Here it will be noted that an appreciably longer period of time is required for a significant reduction in liver catalase activity, but that the ultimate effect is much more marked and there is no tendency to return toward normal within one week. Not enough mice were irradiated to extend this experiment beyond one week.

[1] Under AEC research contract through Medical Division, Army Chemical Corps. Neither is responsible for opinions or conclusions.

TABLE 2

EFFECT OF WHOLE BODY X-RADIATION ON MOUSE LIVER CATALASE

Time after x-radiation	Catalase units per mg protein	% Decrease
(Not x-rayed)	4.5	..
1–2 Minutes	4.1	9
1 Hour	4.4	2
2 Hours	4.1	9
24 Hours	3.6	20
48 Hours	3.3	27
5 Days	1.9	58
7 Days	0.8	82

The fact that x-rays *in vivo* reduce liver catalase, representing about one-third of the total body catalase, makes it apparent that hydrogen peroxide may play a significant role in radiation toxicity. Not only do ionizing radiations produce toxic H_2O_2 throughout the body, but they simultaneously damage severely the body's chief protection against this toxic agent. The possibility exists, of course, that H_2O_2 formed by the x-radiation is the agent actually responsible for catalase destruction.

Inhibition of catalase by x-rays *in vitro* has been reported by Forssberg (*4, 5*), using large doses of x-rays. Tytell and Kersten (*9*) and Barron *et al.* (*1*), on the other hand, found that smaller doses of x-rays did not inhibit catalase *in vitro*. Barron *et al.* (*1*) attribute catalase inhibition *in vitro* by larger doses of x-rays to protein denaturation.

This work has been temporarily interrupted by a sudden unexplained reduction in liver catalase and increase in peroxide sensitivity among our colony of mice.

References

1. BARRON, E. S. G. *et al.* *J. gen. Physiol.*, 1949, **32**, 537.
2. FEINSTEIN, R. N. *J. biol. Chem.*, 1949, **180**, 1197.
3. ———. *Anal. Chem.*, 1949, **21**, 534.
4. FORSSBERG, A. *Ark. Kemi. Mineral. Geol.*, 1945, **21A**, 1.
5. ———. *Nature*, Lond., 1947, **159**, 308.
6. FRICKE, H. *Cold Spr. Harb. Symp.*, 1935, **3**, 55.
7. ROBINSON, H. W. and HOGDEN, C. G. *J. biol. Chem.*, 1940, **135**, 707.
8. SUMNER, J. B. and SOMERS, G. F. *Chemistry and methods of enzymes.* New York: Academic Press, 1947.
9. TYTELL, A. A. and KERSTEN, H. *Proc. Soc. exp. Biol. Med.*, 1941, **48**, 521.

Algin from Sargassum[1]

Fred W. Davis

Marine Laboratory, University of Miami,* and *Florida State Board of Conservation

For a number of years, there has been increasing interest in the extraction of colloidal materials from seaweeds (*5*). One of these materials, sodium alginate, is extracted from the brown algae. Among these seaweeds is *Sargassum*. Parr (*4*) has reported on the occurrence of *Sargassum* in the Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico. Tseng (*6*) has given figures for the seaweed harvests and the annual algin production on the Atlantic and Pacific Coasts.

The literature contains little information on the chemical composition of *Sargassum*. One report (*2*) gives the algin content as low; another (*5*) reports a 20% yield of alginic acid. Because of this dearth of information and the possibility of commercial exploitation, preliminary analyses were made of both fixed and floating varieties of *Sargassum* that occur in Florida waters, in behalf of the Florida State Board of Conservation.

The attached variety of seaweed, *Sargassum filipendula* C. Agardh., was obtained along the south Florida coast in December, 1948. The floating samples included *Sargassum fluitans* Børgessen and *Sargassum natans* (L.) Meyer taken from the Gulf Stream off Miami, Florida, in April, 1949, and an unidentified sample taken from the water at Miami Beach in October, 1948. Determination of the algin was by extraction at room temperature, followed by purification. Results are summarized in Table 1, in which are included, for comparison, results on other seaweeds as reported in the literature.

TABLE 1

Seaweed variety	Month harvested	Algin %, dry basis
Sargassum filipendula	December	13.3
Sargassum (unidentified)	October	17.2
Sargassum fluitans	April	6.8
Sargassum natans	April	9.0
Laminaria digitata (*1*)	January	27.0
" " "	August	19.0
Laminaria saccharina (*1*)	January	23.0
" " "	August	12.0

Variation in the temperature of extraction was tried with *Sargassum filipendula* C. Agardh., with the following results:

Temperature of extraction	Algin %, dry basis
23° C	13.3
40° C	22.2
90° C	23.5

The temperature effect with the floating varieties of seaweed was not so great. There was, however, some evidence of possible bacterial destruction of the algin in the samples taken from the Gulf Stream.

Further studies are planned to cover seasonal variations and to include other constituents along with algin.

References

1. BLACK, W. A. *J. Soc. Chem. Ind.*, Lond., 1948, **67**, 169.
2. HUMM, H. J. *Science*, 1942, **96**, 230.
3. KANEO, HAYASHI. *J. trop. Agr. Taihoku Imp. Univ.*, 1941, **13**, 321: from *Chem. Abstr.*, 1948, **42**, 5425.
4. PARR, A. E. *Bull. Bingham ocean. Coll. VI*, 1939, 12.
5. TSENG, C. K. In ALEXANDER, J. *Colloid chemistry.* New York: Reinhold, 1946. Vol. VI, pp. 629–74.
6. ———. *J. ccon. Bot.*, 1947, I, 69.

[1] Contribution No. 32 from the Marine Laboratory, University of Miami.

X-Ray Investigation on the Change in Orientation of Cellulose in Sound and Infected Tracheids of Chir (*Pinus longifolia*)

J. Sen and B. K. Banerjee[1]

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X-ray study of cellulose orientation in wood has developed into an interesting field of investigation. The cellulose content in wood varies from 40% to 60% and other components include lignin, resin, and fat. Clark (*3*) has made x-ray studies of wood of many species and has obtained the typical cellulose pattern in every case, but he found a considerable variation in the degree of preferred orientation. The tangential, radial, and cross-sectional structures are distinctly different. The orientations of cellulose may fluctuate considerably in different parts of the same tree and in different layers of the same cell wall, and frequently, in some tracheids, in different lamellae of the same layer as well (*2*).

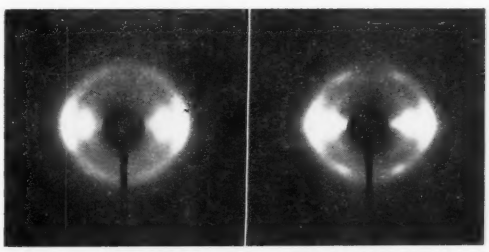

FIG. 1. *Left*—sound sample. *Right*—infected sample.

Bailey and Vestal (*1*), and Bailey and Berkley (*2*) made an interesting observation establishing that in certain ubiquitous fungi enzymatic hydrolysis progresses along the long axes of the fibrils of cellulose, and that the cavities so produced by the fungi are oriented with their long axes parallel to the long axes of the fibrils. It has since been microscopically noted (*4*), following the anatomical methods of Bailey and Vestal, that in chir (*Pinus longifolia*) sapwood infected by *Lenzites striata* there is no constant correlation between the orientation of cellulose and the plane of enzyme action. In the present investigation, small pieces of untreated chir sapwood, both sound and infected by *Lenzites striata* have been sampled from a block of chir sapwood (about 4 in. × 2 in.) and studied by x-rays. Photographs are taken in a cylindrical camera with the x-ray beam normal to the tracheal axis of the tangential section (Fig. 1). As such, the broad central layers of the secondary walls of chir tracheids are prominently exposed to x-rays.

It is evident from the photographs that the patterns, shape, and size of the two spots are not the same. In the case of the sound sample, the spots from the 101 and 101 planes are diffuse and tend to merge into one interference ring and they are drawn into a long diffuse arc along the Debye-Scherrer ring. Similarly 002 interference is drawn into a long arc. But in the case of the infected sample, the corresponding spots are sharp and the other spots on the layer ring are also distinct. Consequently, the degree of disorientation of cellulose crystallites from the tracheal axis is much greater in the case of the sound sample of chir wood than that of the infected sample of the same wood, as has also been confirmed by critical microscopic examination of the central layer of secondary wall of chir tracheids. This clearly shows that the cellulose orientation can be changed by means of enzymatic hydrolysis.

Work is in progress to determine the degree of disorientation of the structural units of cellulose from the fiber axis by measuring the distribution of intensities along the length of the 002 spot with chir wood at various stages of decay.

[1] Thanks are due to Prof. K. Banerjee, D.Sc., F.N.I., for his keen interest during the progress of this work.

References

1. BAILEY, I. W. and VESTAL, MARY R. *J. Arnold Arboretum*, 1937, **18**, 195.
2. BAILEY, I. W. and BERKLEY, EARL E. *Amer. J. Bot.*, 1942, **29**, 235.
3. CLARK, G. L. *Ind. eng. Chem.*, 1930, **22**, 474.
4. SEN, J. *Sci. Cul.*, 1948, **14**, 163.

A Preliminary Note on Naturally Occurring Organic Substances in Sea Water Affecting the Feeding of Oysters[1]

Albert Collier, Sammy Ray, and Wayne Magnitzky[2]

In studying the role of certain industrial wastes in the ecology and physiology of oysters, we have found a significant correlation between the pumping rate of the oyster and a hitherto unreported factor naturally present in minute amounts in sea water. We designate this factor as carbohydrate because it is measured photometrically with the *N*-ethyl-carbazole reagent which can be used quantitatively for estimating minute amounts of carbohydrates.[3] The active agent may be a true carbohydrate, or it may be some other compound which happens to be quantitatively associated with the carbohydrates responding to the test.

The characteristics of the substance as it occurs in the natural sea water supply of this laboratory are as follows: It passes bacteriological filters and is not thrown down by the ordinary laboratory centrifuge. The con-

[1] This work is being done as part of an independent investigation by the authors, to whom the facilities of the U. S. Fisheries Station at Pensacola have been kindly made available by the U. S. Fish and Wildlife Service.

[2] Temporary address (all authors): 205 Moulton Building, Pensacola, Florida.

[3] We wish to acknowledge the assistance of Dr. J. Gordon Erdman, of the Mellon Institute, in suggesting the method as well as adapting it to our particular needs.

centration in different samples ranges from 2 to 25 mg/l and is extremely variable. Concentration in a single sample is constant for 4 days at room temperature (25°–30° C), after which it takes a sharp drop. A short period of boiling does not change the concentration.

The following characteristics of the oysters' behavior in response to the substance are clearly indicated now: The response is directly correlated with changing concentrations; other factors being equal, the greater the carbohydrate concentration the more water the oyster pumps.

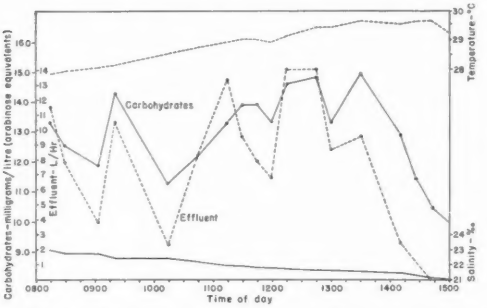

FIG. 1. Relationship between carbohydrate concentration (mg/l in terms of arabinose) and the effluent of a single oyster measured simultaneously. Salinity and temperature determinations were also made at the same moment. The depressed value for the effluent shown in hour 1100 was caused by a normal reflex closure of the valves of the oyster for voiding irritating solids.

The threshold value for pumping varies from oyster to oyster, but thus far (continuous bihourly observations started May 10, 1949) no oyster has remained open and pumped water when the concentration fell below 4.8 mg/l. As the water temperatures increase, the carbohydrate threshold for continued pumping seems to rise. Temperature appears to become especially critical above 28° C, the carbohydrate threshold rising to about 12 mg/l. Salinity variations within wide limits do not play a part. With salinity and temperature conditions within the optimum ranges but with the carbohydrate level below the threshold indicated, the oyster will open for a short period of time which we have come to call a "testing period." If this period coincides with a high carbohydrate value the oyster will immediately begin pumping; if it does not the oyster will close. We have observed this behavior for days at a time. The carbohydrate value can be high for 2 or 3 hr or longer without the oyster's "testing," in which case it will miss the high carbohydrate completely. Detailed, minute-by-minute observation demonstrates an almost immediate response of the oyster to changes in the concentration. (See Fig. 1.) The oyster removes from 5% to 15% of the substance from the water passed through its body.

In addition to the short interval observations shown in Fig. 1, we have now accumulated bihourly observations (24 hr per day) on ten oysters. As many as four of these have been run simultaneously for 30 days. Pairs have been run as long as 60 days. These long term studies are being projected into a field program to determine the ecological significance of this carbohydrate factor.

Experimental work is still in progress and all conclusions must remain tentative, but the indications listed above seem clear enough and of sufficient significance to be presented now. These results are particularly significant in the light of the work of Pütter (*4*), Krogh (*2*), Yonge (*5*), MacGinitie (*3*), Coe (*1*), and others.

References

1. COE, WESLEY R. *J. marine Res.*, 1949, **7**, 586.
2. KROGH, AUGUST. *Biol. Rev.*, 1931, **6**, 412.
3. MACGINITIE, G. E. *Biol. Bull.*, 1945, **28**, 107.
4. PÜTTER, A. *Arch. ges. Physiol.*, 1911, **137**, 595.
5. YONGE, C. M. *J. Mar. biol. Assoc. U. K.*, 1928, **15**, 643; review, H. BLEGVAD, *J. du Cons.*, 1928, **4**, 124.

Maleic Hydrazide, a Selective Herbicide

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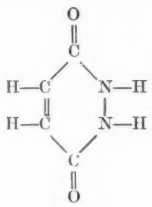
Among several products known to have growth-regulating properties and submitted to us for testing by the Naugatuck Chemical Division, U. S. Rubber Company, Naugatuck, Connecticut, was a sample of maleic hydrazide. It has the formula



and was supplied as the diethanolamine salt. The effect of maleic hydrazide on tomato plants was described as inhibitory (*1*); plants stopped growing for several weeks then resumed normal growth with little apparent injury. The amount of inhibition was proportional to the concentration employed.

Tests on barley and cotton reported here indicate that this compound may possibly prove to be a valuable selective herbicide. Two-week-old barley (var. Sacramento) and 5-week-old Upland cotton (var. Acala), grown in gallon cans, were sprayed to runoff in accordance with the tentative recommendations accompanying the product. The equivalent of 0.2% maleic hydrazide was used in aqueous solution, to which in some instances 0.024% Vatsol was added as a spreader. Spraying was carried out by means of an atomizer under constant pressure, with the plants on a revolving platform.

The immediate effect of maleic hydrazide on barley was to stop growth. This was detected a few days after treatment. Leaves turned dark green and slowly died back from the tips. After approximately 6 weeks, the barley was completely dead but the cotton was apparently

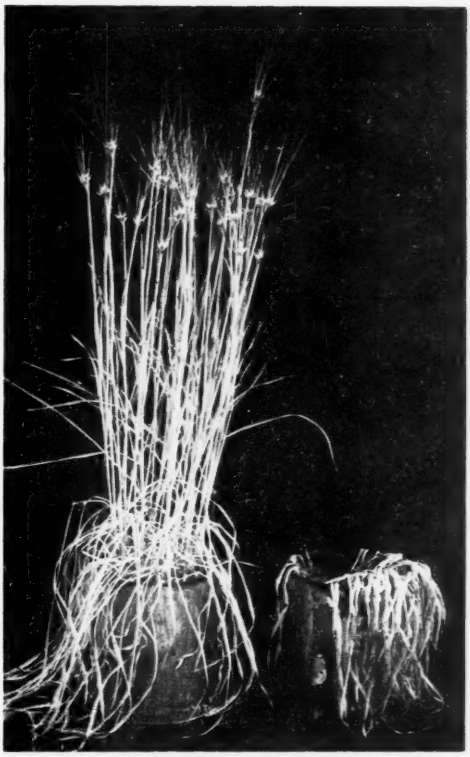


FIG. 1. Effect of maleic hydrazide on barley. Plants on the right treated; on the left untreated.

FIG. 2. Effect of maleic hydrazide on cotton. Plants on the right treated; on the left untreated.

unaffected. Even after 6 additional weeks, the treated cotton was in no way different from the control plants, both coming into flower at the same time. Addition of Vatsol caused more rapid killing of barley, but the end result otherwise was the same. No effect was discernible in cotton, with or without the spreader.

Subsequent tests have proved that various types of plants react quite differently to this new compound. Age of the plants is critical, in that young plants respond to a much greater extent. Cotton treated in the cotyledon stages was very severely inhibited, whereas plants 16 in. in height showed no apparent response. Age of grass plants is also critical. Young water grass (*Echinochloa Crus-galli*) and Johnson grass (*Holcus halepensis*) plants sprayed with 0.2% maleic hydrazide stopped growing, developed anthocyanin pigmentation, and finally died. Older plants showed some response but survived.

Control of grasses is essential to the mechanization of cotton harvesting in the West. Under field conditions, cotton can be kept relatively free of weeds until it is laid by. At this time young grass seedlings are able to grow so rapidly that the plants are tall enough by harvest time to be picked up by harvesters, producing grassy cotton. If this new chemical should provide a solution to this problem, it would prove to be an extremely valuable herbicide. For those who are studying chemical weed control, it presents a new and interesting selectivity. Results already obtained seem to justify very thorough testing of this compound.

Reference

1. SCHOENE, D. L. and HOFFMAN, O. L. *Science*, 1949, **109**, 588.

Effects of Irradiating Maize Pollen in a Nuclear Reactor on the F_1 Plants[1]

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The purpose of this paper is to report preliminary results in determining inherited changes induced by irradiating maize pollen in a nuclear reactor. The work was carried out by making crosses between untreated plants and plants with irradiated tassels, and subsequently studying the phenotypic effects on the F_1 plants. The irradiations were made in the heavy water pile of the Argonne National Laboratory.

The subject of hereditary effects of irradiations associated with the fission process has gained additional significance with the advent of the atomic bomb and the accompanying sharply intensified interest in nuclear energy. In this connection, studies have been made of hereditary changes in maize (*1, 2, 4*) and in cotton (*3*)

[1] Published with the approval of the Director as Paper No. 478 Journal Series, Nebraska Agricultural Experiment Station.

following exposure at the atomic bomb explosion at Bikini in 1946. The radiations involved in the maize work were not designated in the reports, although Brown (*3*) indicated that the effects in cotton were due to gamma rays. Zirkle (*5*) has reported on the biological effects of slow neutrons from a nuclear reactor.

Security considerations make it impossible to report on all facts gained and problems encountered in carrying out the present studies. The information that can be reported follows.

The irradiations were made during the summer of 1947. Mature maize tassels were placed in the thermal neutron column of the heavy water pile as close to the pile proper as possible. The pile was operated at a power in the neighborhood of 300 kw. Tassels were irradiated at various lengths of time at this power. The exposures as reported do not include the time involved in bringing the reactor to the desired power, during which time the tassels were also exposed to the radiations.

TABLE 1

PERCENTAGES OF MAIZE PLANTS WITH ABNORMALITIES IN THE F_1 SPOROPHYTE GENERATION FROM CROSSES OF NORMAL BY NORMAL WITH MATURE TASSELS IRRADIATED IN A NUCLEAR REACTOR

Exposure in nuclear reactor in min	Total no. F_1 plants examined	Percentage with specific abnormalities				
		Percentage with one or more visible abnormalities	Height abnormal	Leaves narrow (grasslike)	Tassels or ear shoots lacking or incompletely developed	Chlorophyll content below normal
0	302	.3	.3	0.0	0.0	0.0
1	297	5.1	4.7	1.0	1.3	0.0
2	287	9.4	8.4	5.9	1.7	0.7
4	208	23.1	22.6	7.7	3.4	0.0
8	104	29.8	28.8	10.6	9.6	4.8
16	3	0.0	0.0	0.0	0.0	0.0

No attempt was made to get a pure source of any one type of radiation by shielding out other types. It is known that ionization at the position of the tassels was due, in a large part at least, to both slow neutrons and gamma rays. The relative ionizations of the two components are not known. The average flux of neutrons at the position of the tassels was 7×10^{10} neutrons/cm^2/sec.

The tassels were irradiated at periods of 0, 1, 2, 4, 8, and 16 min, respectively. Crosses were made by collecting pollen from the tassels within a period of 48 hr following treatment and placing it on untreated female plants. Seed of these crosses was planted in the field at Lincoln, Nebraska, on May 21 and June 8, 1948. Results from the two planting dates were not significantly different and hence have been combined for the purpose of reporting.

Percentage stands of F_1 plants based on number of kernels planted for the various treatment levels were as follows: control, 91.8%; 1-min radiation, 88.1%; 2-min, 82.4%; 4-min, 47.8%; 8-min, 30.8%; and 16-min, 5.3%.

The percentages of F_1 plants that were obviously different morphologically from normal plants, based on visible external characteristics at time of flowering, are reported in Table 1. Plants were classed as abnormal when there were marked, readily recognized deviations from normal with respect to height of plants, width of leaves, development of tassels or ear shoots, or development of chlorophyll. Examples of abnormalities were as follows: Some plants lacked ear shoots or produced shoots with very few or no externally visible silks. Some tassels were reduced in size, or had a reduced number of branches, or the anthers were lacking, empty, or failed to be exserted. The plant that appeared to be the most abnormal of any in the field was one that attained a height of 4 in. and developed only five leaves. It was yellow-green in color, developed no visible ear shoot or tassel, but remained alive throughout the summer. Another yellow-green plant attained a height of 6 in. It had a small tassel, but no ear shoot.

TABLE 2

PERCENTAGE OF F_1 MAIZE PLANTS WITH ABNORMAL POLLEN FROM CROSSES OF NORMAL BY NORMAL WITH MATURE TASSELS IRRADIATED IN A NUCLEAR REACTOR

Exposure in nuclear reactor in min	Total No. plants examined	Percentage of plants with abnormal pollen
0	286	3.5
1	292	22.3
2	268	47.8
4	169	87.0
8	80	91.3
16	3	100.0

There was an increase in percentage of abnormal plants with each increase in length of treatment, except for the 8-to-16-min increase. There were, however, only three plants in the 16-min treatment and hence little significance can be attached to this comparison. Although the percentage of abnormal plants increased with increase in length of treatment, the degree of abnormality in the affected plants did not vary for the different treatment levels.

The effects of the irradiation on pollen of the F_1 plants are reported in Table 2. The percentage of plants with abnormal pollen increased with each increase in length of time of tassel irradiation and equaled 100% at the 16-min exposure.

These results indicate that the irradiation of maize pollen was very effective in producing changes in the F_1 plants. With the longer exposures, the reduction in stands of F_1 plants was drastic. This, together with the fact that a high proportion of the surviving plants had abnormal pollen, may be indicative of the fact that many of the changes consisted of chromosomal aberrations.

References

1. ANDERSON, E. G. *Proc. nat. Acad. Sci.*, 1948, **34**, 387.
2. ANDERSON, E. G. *et al. Genetics*, 1949, **34**, 639.
3. BROWN, META S. *Genetics*, 1948, **33**, 98.
4. RANDOLPH, L. F., LONGLEY, A. E., and LI, C. H. *Science*, 1948, **108**, 13.
5. ZIRKLE, R. E. *Radiology*, 1947, **49**, 271.

A Hitherto Undescribed Coloring Reaction of Certain Human Nerve Fibers

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This note describes a peculiar and consistent coloring reaction of certain human nerve fibers. No similar description has been found in the literature. The authors do not propose to investigate the matter further at the present time, but mention of the phenomenon may stimulate others to do so.

In brief, the new reaction is observed in frozen sections of fresh unfixed human tissues, colored with the periodic acid-Schiff's reagent (PAS) method (*4*). The optimum tissue for the study of this phenomenon is that of the nerve ganglia buried in fatty tissue anterior to the aorta, between the celiac axis and the superior mesenteric artery.

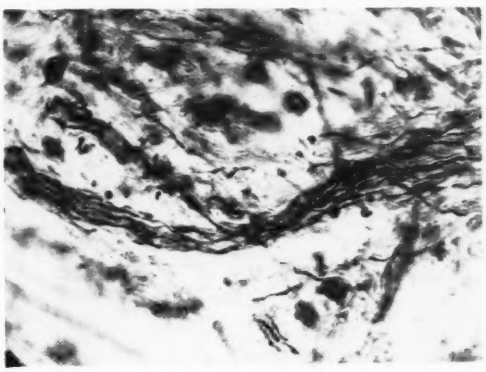

FIG. 1. Human preaortic ganglion, colored by the PAS method. Frozen section, unfixed tissue.

The ganglia, dissected free of fat, and colored with the PAS method on frozen sections, present the appearance shown in Fig. 1.

In such an area it can be seen that many nerve fibers are left uncolored, although some do color with the PAS method. The process of paraffin imbedding removes the faculty of selective coloration. The reaction is not that due to Schiff's reagent alone. Acidity (basophilia) of the fibers is not responsible. The age is not important, nor have we been able to correlate variation with any specific disease.

Relatively few other tissues have been examined for the peculiar reaction of the nerve fibers. In human pectoral muscle a few nerve fibers in the connective tissue give the positive reaction. The termination of these fibers has not been ascertained. In the broad ligament, single nerve fibers give the positive reaction. In these situations repeated observations show the reaction to be selective and consistent.

It is not possible to ascertain the nature of the material responsible for the selective coloration of certain nerve fibers. The fact of its demonstration with the PAS method, developed for carbohydrates (*3*), permits certain inferences. It has been shown that a mucoprotein with choline esterase activity can be isolated from human serum (*1*). The presence of choline esterase at nerve terminations has long been realized (*2*) but its origin is not known. It may be that a carbohydrate of choline esterase type is present in some nerve fibers and is being shown by the present method.

It is repeated that only human tissues have been used in this study and only as unfixed, frozen sections.

References

1. BADER, R., SCHULTZ, F., and STACEY, M. *Nature*, Lond., 1944, **154**, 183.
2. LOEWI, O. *Arch. ges. Physiol.*, 1921, **189**, 239.
3. MCMANUS, J. F. A. *Nature*, Lond., 1946, **158**, 202.
4. ———. *Stain Technol.*, 1948, **23**, 99.

Cumulative Frequency Distribution in Manual Chromatography[1]

Lawrence M. Marshall and William A. DaCosta

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The applicability of partition chromatography to the measurement of physiologically important organic acids has been reported previously (*1*). The chromatographic technique has also been used in measurement of amino acids in protein hydrolyzates (*3*). During studies of the citric acid metabolic cycle in this laboratory, a system of manual chromatography was devised which obviates the tedious collection of each fraction of an effluent acid band. This procedure, unlike that involving collection of effluent acid without fractionation, provides qualitative evidence dependent upon the characteristics of the curve of the chromatogram. This report describes a procedure which increases the practicability of manual chromatography.

The procedure is based on the principle that a cumulative normal distribution, when plotted on arithmetic probability paper, gives a straight line (*4*). Application of this principle to chromatography makes unnecessary the collection of every sample within the predetermined acid zone. The quantities of acid in the fractions collected can be regarded as cumulative frequencies in a normal distribution (*2*). The sum of the quantities of acid in the fractions collected within a given acid zone is equal to the amount of that acid introduced on the column (*2*).

The data presented here were obtained by analyzing a mixture of succinic and fumaric acids. The procedure followed that previously reported for fumaric acid alone (*2*) except that columns of 4 mm instead of 8 mm internal diameter were employed, and 0.5 g rather than 3 g of silica gel was used in each column. Further, 10%

[1] Supported in part by a grant from the Damon Runyon Memorial Fund.

tertiary amyl alcohol-chloroform instead of 5% amyl alcohol was the mobile phase. The columns were 25–27 cm in height. Experience with this type of column and mobile phase had shown that fumaric acid data, conventionally plotted, describe a curve on the chromatogram which deviates from the normal. Succinic acid, however,

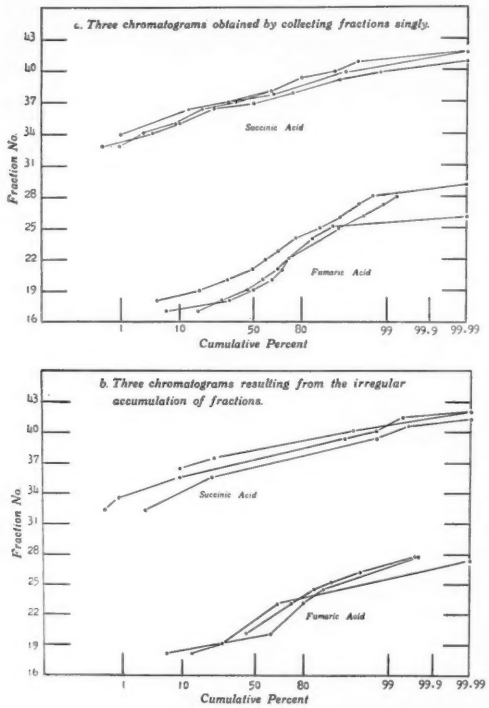


FIG. 1. Cumulative frequency graphs on probability paper of six chromatograms of a mixture of fumaric and succinic acids.

yields a normal curve. Thus, when a mixture of fumaric and succinic acids was examined, each effluent acid was released in a different way by the single column. This provided an ideal test for evaluation of cumulative collection. For example, repeated analysis indicated that when each fraction was collected singly the effluent fumaric acid appeared between chromatogram fractions 17 and 28, whereas succinic acid appeared between fractions 33 and 42. In one experiment, two groups of two or more fractions combined were collected within each of the fumaric and succinic acid zones. At least the first two and last two fractions of each acid were collected singly. In other experiments, the number of groups as well as the number of fractions forming the groups varied. The concentration of each single fraction and each group was determined by titration with standard alkali. The volume of alkali required for each single fraction and each group was considered the frequency statistic, and cumulative percentages were calculated (*4*).

Fig. 1 presents six chromatograms on probability paper. In Fig. 1a, three were obtained by collecting fractions singly. Three typical chromatograms resulting from the irregular accumulation of fractions are shown in Fig. 1b. The data for succinic acid in the experimental collections, as in the controls, approximate a straight line. The data for fumaric acid, because of the irregular release of this acid, as already explained, describe irregular lines in both the experimental and control measurements. A comparison of the position of the mode for

TABLE 1

COMPARISON OF CUMULATIVE AND CONVENTIONAL METHODS FOR COLLECTING FRACTIONS WITHIN AN EFFLUENT CHROMATOGRAPHIC BAND

	Chromatogram No.	Fumaric acid			Succinic acid			
		Taken mg	Found mg	Recovery %	Taken mg	Found mg	Recovery %	Mode*
Conventional method	1	1.74	1.89	109	2.4	2.21	92	37.3
	2	1.74	1.80	103	2.4	2.19	91	37.5
	3	1.74	1.81	104	2.4	1.92	80	37.5
	Average	1.74	1.83	105	2.4	2.10	88	37.4
Cumulative method	4	1.74	1.90	109	2.4	2.29	95	38.0
	5	1.74	1.78	102	2.4	2.32	97	36.0
	6	1.74	1.91	110	2.4	2.40	100	37.0
	Average	1.74	1.86	107	2.4	2.30	97	37.0

* Fraction No. at 50th percentile. Because of the irregularity of the curve for fumaric acid (explained in text), the mode, being meaningless, is not presented for fumaric acid.

succinic acid (i.e., the fraction number at the 50th percentile) and a comparison of the recovery data for both procedures are shown in Table 1.

The final data for cumulative chromatography can be presented on probability paper with each curve representing an effluent acid. If this curve approximates a straight line there is evidence that the acid was released normally by the column. The irregular release of an acid by the column is reflected by a nonlinear curve. Thus collection of each fraction of an acid is obviated and random accumulation within the effluent band is adequate.

References

1. MARSHALL, L., ORTEN, J. M., and SMITH, A. H. *Science*, 1948, **108**, 92.
2. ———. *J. biol. Chem.*, 1949, **179**, 1127.
3. STEIN, W. H. and MOORE, S. *J. biol. Chem.*, 1948, **176** 337.
4. WILKS, S. S. *Elementary statistical analysis.* Princeton, New Jersey: Princeton Univ. Press, 1948. Pp. 14, 144–162.

NEWS and Notes

Laurence Irving, former director of the Arctic Research Laboratory at Point Barrow, has moved to Anchorage, Alaska, as biologist with the Alaska Health and Sanitation Activities of the U. S. Public Health Service. As the director of a unit staff of biologists and physiologists, Dr. Irving will carry on a program of research concerning the adjustment of animals to conditions of the Alaskan arctic regions.

Harold A. Abramson, chief of the Allergy Clinic at the Mount Sinai Hospital, New York City, has been named president elect of the American College of Allergists.

Paul Kosok, chairman of the Department of History at Long Island University, recently returned from a year-and-a-half expedition to Peru, where he discovered and mapped some of the ancient irrigational systems of the Inca and Chimu peoples. Dr. Kosok's expedition was made possible by a grant from the American Geographical Society and a report on his investigations will appear in the society's magazine this spring. His work has been classified by the society as paleohydrology.

Brookhaven National Laboratory has appointed two new staff members to its Medical Department: **Wade N. Miller**, who returned recently from overseas service with the Army Medical Corps as chief of medical service of the Hepatitis Center, European Command, and **James S. Robertson**, formerly associated with the Donner Radiation Laboratory in Berkeley, California.

U. S. scientists invited by Centre National de la Recherche Scientifique to participate in the symposium "Rearrangements Moleculaires en Chimie Organique et Etude de l'Inversion de Walden" to be held in Montpellier, France, April 24–29, are **Paul D. Bartlett**, Department of Chemistry, Harvard University, and **S. Winstein**, Department of Chemistry, University of California at Los Angeles.

Grants and Awards

The gold medal of the Royal Astronomical Society has been awarded to Joel Stebbins, director emeritus of the Washburn Observatory, University of Wisconsin, and now research associate in the Lick Observatory, University of California.

Viking Fund Medals and Awards for 1949 were presented February 10 at a dinner at the Waldorf-Astoria Hotel in New York City. The three people honored for outstanding achievement in the field of anthropology were: *Medalist in General Anthropology*, chosen by the American Anthropological Association—George P. Murdock, Yale University; *Medalist in Archaeology*, chosen by the Society for American Archaeology—Hallam L. Movius, Jr., Peabody Museum; *Medalist in Physical Anthropology*, chosen by the American Association of Physical Anthropologists—William K. Gregory, American Museum of Natural History.

Research Corporation of New York City has made a grant of $2,500 to Francis V. Morriss, New Mexico Highlands University, Las Vegas, New Mexico, for investigations in the stereochemistry of bicyclic ring compounds. Part of the grant is to be used for a fellowship to start in September. Applications are now being received by the Chemistry Department.

Fellowships and Prizes

A David Anderson-Berry Silver-Gilt Medal, together with a sum of money amounting to about £100, will be awarded during 1950 by the Royal Society of Edinburgh to the person who, in the opinion of the society's council, has recently produced the best work on the therapeutic effect of x-rays on human diseases. Applications may be based on both published and unpublished work and should be accompanied by copies of the relevant papers. They must be in the hands of the General Secretary, Royal Society of Edinburgh, 22 George Street, Edinburgh 2, Scotland, not later than March 31.

Science Teachers Fellowships, provided by a grant from the Westinghouse Educational Foundation, will enable 50 high school and preparatory school teachers to attend a six-week program at the Massachusetts Institute of Technology this summer. The program, to begin on July 5, will include a review of fundamentals of physics and chemistry and will cover recent developments in the fields of physics, chemistry, biology, meteorology, geology, and aeronautical engineering.

The Westinghouse grant, in the sum of $62,500, was made last year to provide 50 MIT fellowships of $250 each every summer through 1953.

The 1950 program is open to science teachers in the U. S. who are college graduates or have equivalent qualifications. Applications must be made by *April 1* to Francis W. Sears, Chairman, MIT's Summer Program for Science Teachers Committee, MIT, Cambridge, Massachusetts.

The National Research Council's Committee on Growth, in its advisory capacity to the American Cancer Society on grants-in-aid and fellowships in cancer research, recommended at its meeting on January 16 the award by the society of fellowships totaling $70,550 and grants totaling $1,595,429.

Fourteen American Cancer Society Fellowships in Cancer Research and four Damon Runyon Clinical Research Fellowships were recommended. Made available by the society this year for the first time was a new type of fellowship, British American Exchange Fellowships in Cancer Research, offered to citizens of the U. S. for advanced training and experience in Great Britain in specialized fields of investigation pertaining to the problem of cancer. Two of these new fellowships were recommended at the meeting. Similar fellowships are awarded by the British Empire Cancer Campaign to British scientists for study in the U. S. A major portion of the fellowship fund was reserved to support fellowships

to be recommended from applications which will be considered in April.

The committee recommended the award of 238 grants-in-aid for cancer research; these awards were distributed among 91 institutions in 33 states.

In making its recommendations to the American Cancer Society, the Committee on Growth is guided by the advice of 16 panels and subcommittees representing the principal fields of activity in cancer research. The 101 scientists from 51 institutions in 25 states who make up these panels made their recommendations to the committee at a meeting in Washington, D. C., December 16–18.

The New York Zoological Society again announces grants-in-aid available for its 1950 summer research program at the Jackson Hole Biological Station, Moran, Wyoming. The fourth summer program will include studies in ornithology, mammalogy, parasitology, ecology, botany, behavior, land use, and other biological sciences. Further information may be obtained by addressing Director, Jackson Hole Biological Station of the New York Zoological Society, Moran, Wyoming.

Summer Programs

The Massachusetts Institute of Technology announces a special three-week summer program in food technology to be held June 12-July 30. Requests for information and letters of application should be sent to Prof. Walter H. Gale, Director of the Summer Session, Room 3-107, MIT, Cambridge 39, Massachusetts.

The Special Training Division of the Oak Ridge Institute of Nuclear Studies will conduct the 15th, 16th, and 17th in its series of basic radioisotope technique courses this summer (see Science, October 7, p. 386). The courses are open to senior researchers and 32 participants will be accepted for each of the three repeated courses. Priority will go to those from universities who cannot attend courses offered during the winter months. Dates for the courses are June 5–30, July 3–28, and July 31-August 25. Application forms and additional information may be obtained from Dr. Ralph T. Overman, chairman, Special Training Division, Oak Ridge Institute of Nuclear Studies, P. O. Box 117, Oak Ridge, Tennessee.

Meetings and Elections

The winter meeting of the Optical Society of America will be held at the Hotel Statler in New York City March 9–11. Programs will be mailed to members on February 18. Nonmembers may secure copies by writing Arthur C. Hardy, Secretary, Optical Society of America, Massachusetts Institute of Technology, Cambridge 39, Massachusetts. The annual meeting of the Inter-Society Color Council will also be held at the Hotel Statler, on March 8.

The Fifth International Cancer Congress will be held in Paris July 17–21, during the week of the 50th anniversary ceremonies of the discovery of radium. All sessions of the five-day meeting will take place at the Sorbonne. The program is being organized in three branches: biology and experimentation; pathology, clinic and therapy; and social struggle. Those wishing to present papers should submit title and abstract to the Office of the Secretary, Union Internationale Contre le Cancer 6, Avenue Marceau, Paris 8e, before *April 1*.

The Southwestern Division of the AAAS will hold its annual meeting in Flagstaff and the Grand Canyon, Arizona, April 30–May 4. The host institutions will be the Arizona State College, the Lowell Observatory, the Museum of Northern Arizona, and the Grand Canyon National Park. An excellent program has been arranged under the chairmanship of Harold S. Colton. Registration and the general session are scheduled for Monday, May 1, and section sessions for Tuesday and Wednesday mornings. Field trips to the Grand Canyon have been planned by the Canyon Committee on Wednesday afternoon and Thursday. Hotel or other reservations may be made by writing directly to Dr. Arthur Adel, Arizona State College, Flagstaff, Arizona.

Those wishing to submit papers should send the title with abstract to the secretary of the proper section before *March 15*. The section secretaries are: *Botanical Sciences* and *Zoological Sciences*, Harold C. Bryant, Superintendent, Grand Canyon National Park; *Physical Sciences*, Jesse A. Hancock, Texas Western College, El Paso, Texas; *Social Sciences*, Katherine Bartlett, Flagstaff, Arizona.

The Sixth International Congress of Radiology will convene in London July 23–30. Those planning to attend are urged to register as soon as possible. A higher registration fee will be charged after *April 1*. Abstracts of papers to be presented at the meeting should be mailed by the same date and the secretary-general must be notified by *February 15* that the paper is being submitted. All communications should be sent to the Secretary-General, Sixth International Congress of Radiology, 45 Lincoln's Inn Fields, London, W. C. 2. Copies of the preliminary program can be obtained from the same address on request; the language desired should be specified.

Problems of behavior theory will be considered by seven psychologists at a conference scheduled for June 19–August 18 at Dartmouth College, to be sponsored by the Social Science Research Council in cooperation with the Carnegie Corporation. Members of the group are William K. Estes and W. S. Verplanck, Indiana University; Sigmund Koch, Duke University; Kenneth MacCorquodale and Paul E. Meehl, University of Minnesota; and Conrad G. Mueller and W. N. Schoenfeld, Columbia University.

The first International Mathematical Congress since 1936 will be held in Cambridge, Massachusetts, August 30–September 6, under the sponsorship of the American Mathematical Society. A grant of $10,000 has been made by Unesco to be used for traveling expenses of foreign mathematicians. A conference which it is hoped will lead to the formation of an international mathematical union will be held just before the congress. Unesco has made another grant of $10,000 for transportation of delegates to this conference.

The Second International Sesame Conference will be held at Maracay, Venezuela, September 18–20, with headquarters at the Instituto Nacional de Agricultura. Further information can be obtained from D. G. Langham, head of the Department of Agronomy and Genetics, Venezuelan Ministry of Agriculture, Caracas, Venezuela.

"Anomalies in Reaction Kinetics" will be the subject of a symposium to be held at the University of Minnesota June 19–21 by the Division of Physical and Inorganic Chemistry of the American Chemical Society. Further information may be obtained from the divisions secretary-treasurer, Milton Burton, University of Notre Dame, Notre Dame, Indiana.

Industrial Laboratories

A new *Bibliography of Polarographic Literature* has been published by Leeds and Northrup Company. It is an up-to-date listing of all available literature on the polarographic method of chemical analysis, consisting of 2,208 references by 1,310 authors on 903 principal subjects. The articles are listed in chronological order from the earliest associated work in 1903 up to the middle of 1949. All references are cross-indexed alphabetically by authors and by subject. Single copies may be obtained free of charge from Leeds and Northrup Company, 4934 Stenton Avenue, Philadelphia 44, Pennsylvania.

Jesse W. Huff has been named director of biochemical research for **Sharp and Dohme, Inc.**, Philadelphia, to succeed Richard H. Barnes, who was appointed assistant director of research in October, 1949. Dr. Barnes served in both positions until Dr. Huff's appointment.

NRC News

A Committee on Biochemistry advisory to the Office of Naval Research has been set up in the American Institute of Biological Sciences, which operates in the Division of Biology and Agriculture. It is the first of several such committees designed to evaluate research projects in biology submitted to ONR, and to provide advice on the support of such projects. Members of the new committee are: chairman, Cornelius B. van Niel, professor of microbiology, Stanford University; Paul R. Cannon, chairman of the Department of Pathology, University of Chicago; John D. Ferry, professor of chemistry, University of Wisconsin; Jackson W. Foster, professor of bacteriology, University of Texas; Irwin C. Gunsalus, professor of bacteriology, Indiana University; Michael Heidelberger, professor of biochemistry, Columbia University; Samuel Lepkovsky, professor, Poultry Division, University of California; and Fritz A. Lipmann, head of the Biochemical Research Laboratory, Massachusetts General Hospital, Boston. The committee will meet February 16–17.

The NRC is revising its directory, ***Industrial Research Laboratories of the United States,*** the eighth edition of which appeared in 1946. More than 3,700 companies have so far been asked to submit information for the ninth edition, and the NRC is requesting any organization which has not yet received a questionnaire to write and ask to be included in the book. Any company, organization, or individual maintaining a laboratory in which any research or development work is done may qualify for inclusion in the directory, and any organization which provides scientific research services to business or industry may also be listed.

Forms on which information may be submitted for the directory may be obtained by writing to Dr. Myron J. Rand, NRC, 2101 Constitution Avenue, Washington 25, D. C.

A symposium volume entitled ***Applied Sedimentation,*** containing 35 papers on the practical applications of this field, has been prepared by the Committee on Symposium on Sedimentation of the Geology and Geography Division. Parker D. Trask, chairman of the committee, edited the symposium, which will be published in March by John Wiley and Sons, Inc.

The chief purpose of the symposium is to acquaint geologists and engineers with the many fields in which a knowledge of the practical aspects of sedimentation is helpful, and to increase cooperation in work on these problems. The book is designed also to point out to students the opportunities in the field, and to be a useful reference work to consulting geologists and engineers.

The following additions have been made to the **Advisory Committee on Artificial Limbs:** Craig L. Taylor, University of California at Los Angeles, H. D. Eberhart, University of California at Berkeley, Rufus H. Alldredge, New Orleans, Louisiana, and T. Campbell Thompson, New York City. Verne T. Inman, University of California Medical School at San Francisco, has been appointed as a consultant to the committee.

Deaths

Clarence A. Reed, horticulturist and specialist in the development of pecan and filbert nuts, died January 14 at Lakeland, Florida, at the age of 69. Dr. Reed retired in 1947 after 40 years' research in the Department of Agriculture's Bureau of Plant Industry. His work led to the establishment of pecan experiment stations in many parts of the country.

Virgil Snyder, professor emeritus of mathematics at Cornell University, died January 4 at Ithaca, New York. Dr. Snyder was president of the American Mathematical Society in 1927–28 and had taught at Cornell for 43 years, retiring in 1938. He was 80 years old.

Calvin Wells McEwan, 43-year-old archaeologist, died January 12 after a long illness. Dr. McEwan served as field director of expeditions for the Oriental Institute of Chicago before the war and spent much of his time in the Near East.

The Registry of Rare Chemicals, 35 West 33rd Street, Chicago 16, Illinois, lists the following wanted chemicals: ulmic acid, cysteic acid, adrenochrome, kaemferol, quercetagetin, boron tribromide, cobalt carbonyl, potassium peroxide, zirconium bisulfate, calcium plumbite, 1-nona-

nethiol, thiacyclopropane, palmityl chloride, *n*-dodecafluoropentane, octadecylbenzene, oxy hemoglobin, β-ketopalmitic acid, oxindole, and *n*-methylethyleneimine.

Make Plans for—

Pittsburgh Conference on Analytical and Applied Spectroscopy, sponsored by the Analytical Division of the American Chemical Society's Pittsburgh Section and the Spectrographic Society of Pittsburgh, February 15–17, William Penn Hotel, Pittsburgh.

National Science Teachers Association's Advisory Council on Industry-Science Teaching Relations, February 25, Chalfonte-Haddon Hall Hotel, Atlantic City, New Jersey.

American Institute of Chemical Engineers, regional meeting, February 26–March 1, Rice Hotel, Houston, Texas.

Alabama Academy of Science, 27th annual meeting, March 16–18, Alabama Polytechnic Institute, Auburn, Alabama.

Biometrics Society and Institute of Mathematical Statistics, joint session March 17–19, Chapel Hill, North Carolina.

Recently Received—

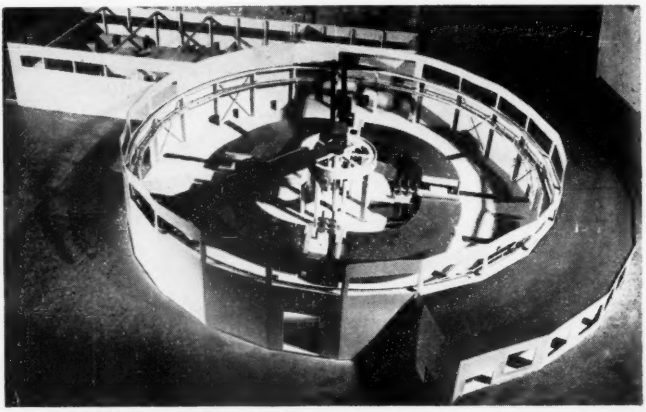
Sea Anemones and Corals of Beaufort, North Carolina. Bull. No. 5. Louise Randall Field. Duke University Press, Durham, N. C. $2.

Vitamin E: Annals of the New York Academy of Sciences. Vol. 52, Art. 3. Karl E. Mason *et al.* New York Academy of Sciences, Central Park West at 79th Street, New York City. $4.50.

The Field Scientific Liaison Work of Unesco. Unesco Publ. Columbia University Press, New York City. 30 cents.

Effect of Permanent Flooding in a River-Bottom Timber Area. Lee E. Yeager. Illinois Natural History Survey Bulletin, Vol. 25, Art. 2. Department of Registration and Education, Urbana, Ill.

Additional Phanerogams in the Flora of Guam, with Notes on Unvarified Records. U. S. National Herbarium, Vol. 30, Part 3. Egbert H. Walker and Robert Rodin. U. S. GPO, Washington 25, D. C. 15 cents.



SCALE MODEL OF A PROTON SYNCHROTRON. The original, known as the Bevatron, is being built in an excavation that spreads over almost an acre of ground on a hill overlooking the Berkeley campus of the University of California. It embodies a principle, developed independently by V. Veksler and E. McMillan, and put in practical form by W. M. Brobeck, to remove the natural energy limit of the cyclotron's action, imposed by the fact that as particles approach the speed of light their relativistic mass increases so that they fall out of step with the voltage reversals that accelerate them. Tie proton synchrotron takes advantage of this lag by varying both the magnetic field and the frequency in proportion to the mass increase. A 1.3-Bev proton synchrotron (an independent development of M. L. Oliphant), is being built at the University of Birmingham, England, and another for about 3-Bev energies is under construction at Brookhaven (the Cosmotron). When completed, the Berkeley Bevatron is expected to yield protons of 3½ Bev, and it can be modified to operate at about 6 Bev. A quarter-scale model of the Bevatron is now in operation at Berkeley for test purposes.

Assistance to Greece and Turkey: 8th Report to Congress. U. S. Department of State. U. S. GPO, Washington 25, D. C.

The British Interplanetary Society Annual Report and List of Members. 157 Friary Road, London, S.E. 15.

Commonwealth Fund, Annual Report. Commonwealth Fund, 41 East 57th Street, New York City.

Marine Biological Station at Port Erin, Isle of Man: Annual Report for 1948. University Press of Liverpool, Liverpool, England. 3 s.

Pacific Science Board Second Annual Report, 1948. National Research Council, Washington 25, D. C.

Annual Reports on the Progress of Chemistry for 1948. Vol. 45. The Chemical Society, Burlington House, Piccadilly, London. W. 1. £1.5. Od.

The Probable Errors of Yale Parallax Plates. Harold L. Alden. Trans. Astronomical Observatory, Yale University, Vol. 15, Part II. Observatory, Yale University, New Haven, Conn.

Style Manual for American Standards. American Standards Association, 70 East 45th Street, New York City 17.

The Smog Problem in Los Angeles County: Second Interim Report. Stanford Research Institute. Committee on Smoke and Fumes, Western Oil and Gas Association, 510 West Sixth Street, Los Angeles 14, Calif.

The Pseudoscorpions of Illinois. C. Clayton Hoff. Illinois Natural History Survey Bulletin, Vol. 24, Art. 4. Department of Registration and Education, Urbana, Ill.

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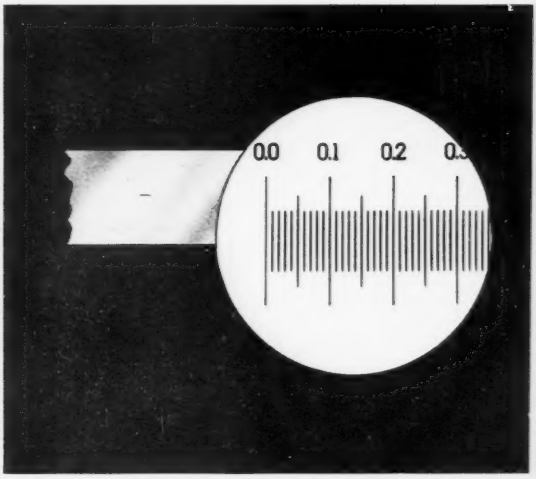

At Palomar the 48-inch Schmidt telescope is photomapping the sky. Its wide-angle optical system focuses an area equal to a dozen diameters of our moon on a single 14x14-inch plate. The sky atlas of more than 2,000 overlapping prints will be finished in four years. The plates are Kodak Spectroscopic Plates, Type 103a, particularly sensitive to light of low intensity. Exposures in matched pairs (through blue filter for 30 minutes, through red filter for an hour) collect and build up images of starlight far too faint to be seen with even the finest optical instruments.

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• **These examples** show the variety in one family of Kodak sensitized materials—Kodak Spectroscopic Plates and Films. Available in 10 different emulsion types and 18 different kinds of spectral sensitizing, they offer special advantages in the study of any part of the spectrum from 240mμ to 1200mμ.

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3. Closing Date: Advertisements must be received by SCIENCE, 1515 Mass. Ave., N.W., Washington 5, D. C., together with advance remittance, positively not later than 14 days preceding date of publication (Friday of every week).

POSITIONS WANTED

Bacteriologist: Ph.D.; several years' teaching experience; eight years, director of research and consultant, large food manufacturing company; for further information, please write Burneice Larson, Medical Bureau, Palmolive Building, Chicago. X

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Biologist: Ph.D. Ecology. Seven years college teaching. General Biology, Plant Morphology, Plant Taxonomy, Bacteriology, Ecology. Research publications. Desires Summer position. Box 28, SCIENCE. 2/17

Geology: Man, 40, married, Ph.D. Teaching experience two large schools, Midwest and East. Also five years with major oil company in Gulf Coast region. Publications. Desire permanent teaching position in stratigraphy, paleontology. Would also consider position as department head in medium-size liberal arts college. Prefer Northeast. Expect approximately $4500 salary. Box 29, SCIENCE. X

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Physicist: M.A. Fifteen years laboratory experience. Desires applied electronics or University connection leading to Ph.D. Box 26, SCIENCE. 2/10

Scientist-Administrator: Physicist (Ph.D.), experienced in nationwide problems of scientific administration as well as research and teaching, seeks a position requiring both scientific training and administrative ability. Box 20, SCIENCE.

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Graduate Physicist with one or two years industrial experience, preferably with some training in chemistry, is required for development work involving the fields of mechanical properties of matter, heat and moisture transfer, optical properties of films, and sound absorption as applied to wood fiber products. Location: Upper Midwest. Box 32, SCIENCE. X

Histologist (pathologist), preferably M.S., for therapeutic research institute in New York City, to prepare mammalian tissues for histopathologic examinations. Experience in performing routine examination of such material highly desirable, though not essential. Salary open depending upon qualifications and experience. Box 31, SCIENCE. X

Pharmacologist or Physiologist: Recent Ph.D. or experienced M.S. as assistant to pharmacologist for pharmacodynamic research in growing pharmaceutical company in Metropolitan New York. Give details in first letter. All replies confidential. Box 18, SCIENCE. 2/24

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Positions Open:
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Writer: Psychological, psychiatric, or mental health background. Must be experienced writer, for both professional and lay audience. Need not be M.D. Location Southwest. Give complete details, samples, photograph, and salary expected. Box 17, SCIENCE. 2/10

The Market Place

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Single insertion	$16.00 per inch
7 times in 1 year	14.50 per inch
13 times in 1 year	13.00 per inch
26 times in 1 year	11.50 per inch
52 times in 1 year	10.00 per inch

2. **Payment:** For all *classified* ads, payment in advance is required, before insertion can be made. Such advance remittances should be made payable to SCIENCE, and forwarded with advertising "copy" instructions.
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3. **Closing Date:** Classified advertisements must be received by SCIENCE, 1515 Massachusetts Avenue, N.W., Washington 5, D. C., together with advance remittance, positively not later than 14 days preceding date of publication (Friday of every week).

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The Market Place

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Ref. Chromatography of Amino Acids on Starch Columns—
W. H. Stein and S. Moore, Jrnl. Biol. Chem. 176, 337,(1948)

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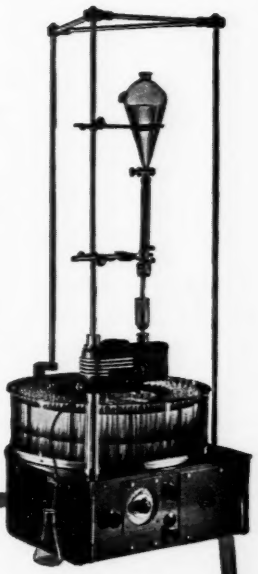
because the possibility of human error is automatically ruled out. Now fraction-collection becomes a straightforward mechanical procedure.



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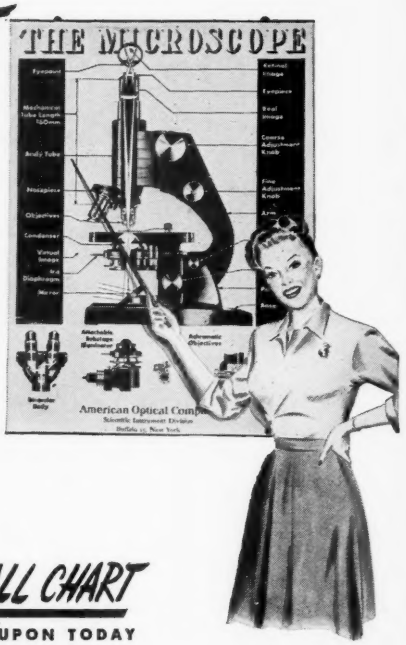

This chart is invaluable for teaching microscopy or optics to science classes. It includes a simplified, easy-to-follow light path and *both* optical and mechanical nomenclatures.

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